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Science and the State

THE meeting of the British Association at Oxford has attracted an exceptional amount of public notice this year, largely, no doubt, on account of H.R.H. the Prince of Wales having consented to deliver the Presidential address. It was naturally gratifying to the British Association thus to receive the sympathetic encouragement of Royalty for their labours, and surely an indication that science is at last coming into its own in the popular estimation.

The Prince, in his address, struck exactly the right note, showing his familiarity with many of the recent advances of science, but alluding to them in terms that the layman could readily understand. He pointed out how the intimate association of science with our daily lives has helped to dispel the attitude of mistrust of science, as being in some way allied with the Powers of Darkness. He recalled the words of the Prince Consort, who, as President in 1859, expressed the hope that, as a result of the public recognition of the value of science, "it may no longer require the begging box, but speak to the State, like a favoured child to its parent, sure of his parental solicitude for its welfare." In the latter part of his address he referred to the work of the National Physical Laboratory and of the Department of Scientific and Industrial Research as illustrating the direct interest now taken by the State in science and its applications.

At the time when the Department was initiated there were some, even among scientists, who feared that State encouragement might lead to freedom in research being confined. These fears have proved quite groundless. It is, indeed, impossible to fetter individual experiment in this way, and at the present time the amount of personal research is greater than ever before.

In the greater part of his address the Prince surveyed some of the chief lines of inquiry dealt with by the Association, and gave many instances of the way in which science has revolutionized daily life. He recalled the great electrical industry that has arisen from the pioneering work of Faraday and others, and which has furnished us with light and power on a scale unprecedented. He referred to advances in illumination as a noteworthy benefit resulting from applied science. He touched on advances in medical discovery, referring particularly to the cases of insulin, the isolation of vitamines, and the sunlight treatment. In dealing with the latter subject, and with the recent discoveries in connection with cancer, he urged that patience and caution were as necessary as ever. But there is a new spirit of hope and enthusiasm, and a bright outlook for the future.

In the final portion of his address the Prince referred to the part played by science in the Great War. This leads us to refer to another popular conception—the idea that science is in some way responsible for the havoc and destruction of modern weapons—that it may be compared with a volcano, out of which anything may come! Truly, it is impossible to foresee what scientific research may ultimately produce. But whether these gifts prove a blessing or the reverse depends entirely on the use that humanity makes of them. The misuse of these gifts is by those who have not, in the best sense, the scientific spirit, which implies the utilization of discovery for the benefit of mankind.

Provisions on Lighting in the New Factory Bill

AS announced in our last issue, the new Factories (No. 2) Bill contains important provisions in regard to lighting. The three clauses relating to this matter are as follows:—

(1) Effective measures shall be taken for securing and maintaining sufficient and suitable lighting in every part of the factory in which persons are working or passing.

(2) The Secretary of State may, by special order, prescribe a standard of sufficient and suitable lighting for factories or for any class or description of factories or parts thereof or for any process.

(3) All glazed windows and skylights of workrooms shall, so far as reasonably practicable, be kept clean on both the inner and outer surfaces and free from obstruction.

The inclusion of these clauses is a most important step and the culmination of the considerable amount of preparatory work that has been done in this field during many years. We are glad to see that lighting now takes its proper place in factory legislation, being ranked with adequate heating, ventilation and sanitation as an essential to health, safety, and efficiency of work.

The ground has been very thoroughly prepared for this step, and the interval of time that has elapsed since the year 1911, when the Departmental Committee on Accidents in Factories and Workshops issued its report recommending that "general statutory powers to require adequate lighting" should be conferred on the Home Office, has been wisely used. The issue of this report was followed very shortly by the appointment in 1913 of the Home Office Departmental Committee on Lighting in Factories and Workshops, whose reports, issued in 1915, 1921, and 1922, are now widely known and contain records of a most comprehensive inquiry into the whole subject.

As a result of these investigations the requirements of proper industrial lighting are much better understood. The fundamental principles of good illumination have been made familiar to managers and workers by the educational efforts of factory inspectors and of the Illuminating Engineering Society and other bodies. Recent reports of H.M. Chief Inspector of Factories have drawn attention to the steady progress in factory lighting during recent years, and the sympathetic co-operation of the Joint Industrial Councils has done much to bring about a recognition that good lighting is in the interests of employers and workers alike.

It will be observed that the framing of the clauses conveys general powers to require suitable and sufficient lighting, and enables the Secretary of State to define requirements by special orders. Clause (1) would doubtless be covered by the recommendations already made by the Home Office Departmental Committee in the interests of safety. Clause (2) provides for the special requirements necessary for the carrying on of work. Such factors as sufficiency of working illumination, absence of glare, and inconvenient shadows, etc., have here to be considered. Naturally the requirements may vary somewhat in different industries, but a considerable amount of work has already been done towards defining such conditions, and the researches being undertaken by the Illumination Research Committee, working under the Department of Scientific and Industrial Research, should prove extremely useful.

The representative and impartial character of this Committee, and the fact that several of its members are also members of the Home Office Departmental Committee on Lighting in Factories and Workshops, should enable it to obtain in due course just the kind of information needed as a basis for the ultimate framing of standards.

The Lighting of a Large Reading Room

THE lighting of the imposing library at the University of Michigan, recently described by Professor H. H. Higbie before the Illuminating Engineering Society (U.S.A.) (see pp. 255-266), has several interesting features. Here we have a decidedly novel method of treatment, the adoption of a method of general lighting that is entirely indirect, but is supplemented by specially designed local units, and is designed to avoid the chief drawbacks usually associated with this method of lighting. Published data gave little aid to the design for such an exceptionally large room, and methods had to be worked out on fundamental principles. In the circumstances, the agreement between calculated and observed values of illumination was good, and the analysis of the various factors which contribute to discrepancies between calculated and observed values is most instructive.

The general lighting is from units assembled on the tops of the shelves, light being directed upwards on the extensive arched ceiling. The local lighting is furnished by rows of tubular lamps, below which there is a sheet of inclined opal glass, and the whole is housed in by casing running the length of the tables. Thus, in the room not a single light source is visible, and there are no disfiguring forests of standards, etc., to interfere with the view of the interior. The high and relatively uniform illumination furnished by the table lamps renders deterioration of the general indirect system of small moment, so far as the comfort of readers is concerned. The introduction of the opal glass in the table units seems to have been very effective in avoiding inequalities in brightness and striations, and there are no troublesome shadows. This combination of local and general lighting avoids one of the chief drawbacks of indirect lighting—the fact that the brightness of the illuminated pages of books may be comparable with or even less than the brightness of surroundings. The extra illumination on the reading tables is also psychologically favourable to the mental concentration of readers.

The experience gained in the maintenance of this extensive indirect system is worth notice. It is generally recognized that the efficiency of a purely indirect system must deteriorate considerably in course of time. In this case a comprehensive series of surveys of the illumination led to the conclusion that a diminution to about 20 per cent. of the original value might be expected in about six years. Redecoration of walls and ceiling apparently doubled the available illumination, but was a costly undertaking; in fact, it is estimated that the substitution of lamps of higher wattage would be a more economical expedient. The fact of the reading illumination being furnished by the local units, deterioration in which is relatively small, rendered the loss in general illumination of less consequence. Apparently it did not interfere materially with the reading of titles of books on shelves, chiefly owing to the good diffusion and absence of inconvenient shadows (which are apt to be a troublesome feature of direct lighting in libraries). But the fact of such a large decrease in illumination being recorded gives food for thought.

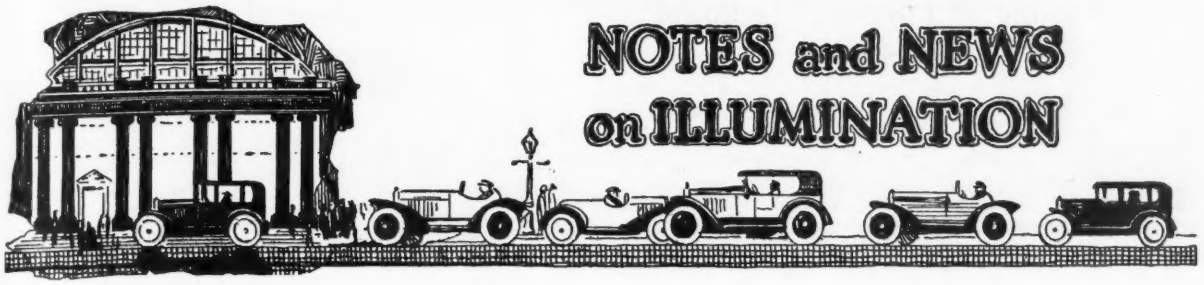
The Need for a Standard of White Light

THE proceedings at the Optical Convention, summarized in our May issue, served to show how greatly we have advanced towards standardization in many fields of optics. But the excellent survey of colorimetry contributed by Mr. Guild, to which we have also recently referred,* made it clear that there are many gaps in our knowledge of this subject, and especially lack of coherence in schemes for standardizing and specifying colour. Each industry dependent on colour has its own special terms to describe colours.

The variety is accentuated by the fact that the appearance of a coloured object depends so much on the quality of the light by which it is illuminated. To illuminating engineers this problem is of special interest in view of the variety of forms of "artificial daylight" units that have been introduced. Some of these aim at the greatest possible accuracy in imitating average daylight; others, such as the "Restlight," which uses a modification of the Lamplough glass and the latest types of Sheringham reflector, mentioned in our last number,† are admittedly approximations.

On one point illuminating engineers are keenly conscious of present deficiencies, the absence of any really satisfactory definition and standard of white light. As a theoretical basis the radiation from a black body operating at 5,000° K, which might be taken as equivalent to average daylight, has been suggested. We cannot, in practice, realize this temperature by any known means. Yet daylight is itself so variable, both in colour and intensity, that we have no prospect of a natural standard. The most hopeful solution would seem to lie in the adoption of a standard incandescent source, equipped either with suitable filters or with a combination of nicols and quartz plate, as Priest has suggested. Assuming that sufficient reproducibility could be ensured this might serve as a standard against which "artificial daylight" lamps could be compared.

* *The Illuminating Engineer*, July, 1926, pp. 200-201.
† *The Illuminating Engineer*, August, 1926, p. 238.



Illuminating Engineering During September

During the present month there are several events of special interest to illuminating engineers. Chief amongst these is the Twentieth Anniversary Convention of the Illuminating Engineering Society in the United States, which is being held in Spring Lake, New Jersey, during September 7th-10th. On page 259 we give the programme of proceedings, and we are also fortunate in being able to publish an abstract of the interesting Presidential address delivered by Mr. Luckiesh on the opening day (pages 260-262). We propose to deal with some of the papers presented—a very comprehensive list—in our next issue. Another event, announced in our last issue, is the third Annual Meeting and Conference of the Institution of Public Lighting Engineers, which is being held in Newcastle during September 14th-16th. We hope also to deal with this conference in our October issue.

Improved Gas Lighting in Westminster

We observe that the Westminster City Council, after reviewing the gas lighting arrangements in the City, have determined to substitute 180 candle-power lamps in the place of the present 90 candle-power lamps used in many of the side streets. It was felt that the contrast between the illumination in these streets and the more brightly illuminated main thoroughfares is too great. The arrangement is to be spread over a number of years. There are at present 1,456 of the 90 candle-power lamps in use, and for the moment the replacement of 450 selected lamps has been agreed upon. The change will not be very expensive, as the cost of alteration only amounts to 10s. 6d. per lamp and will only involve the substitution of larger burners in existing lanterns. Special attention is to be paid to the lighting of street corners. This new step seems a desirable one that might be imitated in other London areas. There is a general recognition that the contrast between the illumination in side streets and main streets often constitutes one of the chief defects in modern street lighting, and is liable to cause traffic accidents.

What Type of Lighting Best Suits My Needs?

Under this title, *System* publishes an article by Mr. Ward Harrison discussing various systems of lighting from the business standpoint. Mr. Harrison devotes special attention to the choice of reflectors, which is, indeed, the crux of successful industrial lighting. Other points referred to are the design of suitable switching and wiring facilities, especially allowing room for expansion to meet the probably increasing lighting requirements of future years, the uses of daylight lamps, etc. It is encouraging to find an article emphasizing the necessity for good illumination in a business journal. A great deal remains to be done towards developing general interest in good illumination by appropriate articles in technical journals, and this forms one of the best methods of propaganda.

Traffic Signals

The idea of traffic-control signals has caught the popular imagination, as is shown by a well-illustrated article on the subject in a recent issue of *The Graphic*. The luminous signals being tried in Piccadilly have excited much interest, but it may be noted that in Wolverhampton somewhat similar devices have already been in use for some time. It is generally assumed that these luminous traffic-control systems are mainly an American product, and it is true that in some of the leading American cities they are very widely used. But, as we have recently noted, the idea is being experimented with in Germany, whilst, among other cities, Milan has also introduced traffic-towers. Even in Japan the policeman, white-garbed, is now aided by luminous signal-columns, resembling those used in some American cities but bearing Japanese characters. Experts, in discussing this subject, never fail to point out that each city must work out its own salvation. It is unlikely that the block method adopted in New York, with its system of wide streets and avenues crossing one another at right angles, could be applied in London with its many narrow and winding streets. The gyratory system at important traffic junctions is, we believe, an experiment peculiar to this city, and so far seems to be working out successfully. It may be anticipated, however, that luminous traffic-signals will ultimately be much more widely adopted.

The Illumination of Factories

We have received a copy of the address on the above subject delivered by Mr. L. Gaster before the International Medical Congress for Industrial Accidents and Diseases, held in Amsterdam last year. The address discussed some of the chief problems of industrial illumination, and contained a survey of recent researches conducted in Great Britain in this field—such as those of the committee working under the Department for Scientific and Industrial Research and the Home Office Departmental Committee on Lighting in Factories and Workshops. Attention was also drawn to the effect of inadequate lighting on the eyesight of workers, especially in trades involving considerable strain on the eyes, e.g., the printing and garment-making industries, and to the influence of colour—a field of special interest to the psychologist. In conclusion it is recalled that Holland was amongst the very earliest countries to include requirements of good lighting in its factory legislation.

Aerial Transport by Night

An event of considerable importance in the history of aerial transport was the first night flight with passengers carried out last month in one of the air liners of Imperial Airways. Captain G. W. R. Hinchliffe carried 11 passengers. Leaving Ostend at 10-30 p.m., he alighted in the beam of a giant searchlight at Croydon Aerodrome at 12-10 a.m. The importance of commercial flying by night was strongly emphasized by Lieut.-Col. Blandy in his paper before the Illuminating Engineering Society a few years ago. It was pointed out that for long-distance journeys aviation may be at a disadvantage with travel by ship or railway if flying has to be interrupted during the night-time. With regular flights both by night and day the speed of other methods of locomotion would be left far behind. Progress in this direction is largely a matter of scientific illumination of airways, in which great progress has been made during recent years.

The Closing of Finsbury Technical College

The recent announcement of the closing of Finsbury Technical College, though not unexpected, will cause genuine regret to many who remember the fine work which this institution has done. It was founded in 1878, in the very early days of electrical engineering, and it was there that Professor W. E. Ayrton and Professor J. Perry commenced their famous and productive association. There, too, much original work, including a part of Mrs. Ayrton's researches on the arc, was done. Professor Ayrton and Professor H. E. Armstrong (who had charge of the chemical department), were afterwards transferred to the City and Guilds Engineering College, and Professor Perry to the Royal College of Science. But the tradition was carried on under the very able direction of Professor Silvanus Thompson, probably one of the greatest lecturers on technical subjects this country has possessed—whom we recall with esteem and affection as the first President of the Illuminating Engineering Society. Professor Armstrong's place was taken by Professor Meldola, whose work likewise did a great deal for the reputation of the college. The death of both these eminent scientists during the war was a great loss. From 1910 onwards financial difficulties had already made themselves felt, and these were greatly accentuated by experience during the war. The decline has also been attributed to the increasing importance attached to degrees by public bodies, and even by commercial concerns. The Finsbury Technical College only bestowed its own certificate, but there can be no question of the value of the training it afforded at a time when facilities for instruction in science and engineering were very much less than at present.

The Retirement of Professor J. A. Fleming

Another link with the past has been severed by the news of the impending retirement of Professor J. A. Fleming, who has occupied the position of professor of electrical engineering at University College, London, since the initiation of the department in 1885. Professor Fleming, like Professor Silvanus Thompson, will always be remembered as a great popular lecturer. Many of his addresses before the Royal Institution, for instance, were models both as regards delivery and illustration. Professor Fleming's name, however, is associated with a vast amount of original work. Perhaps his work on wireless telegraphy and valves has brought him the greatest renown, but there can be few sections of electrical engineering which have not received some impression at his hands. In the field of illuminating engineering his name is associated with the electric incandescent lamp standards which formed the basis of those now so widely used for the preservation of the standard of light.

Science in Antiquity

In the very interesting paper read by Dr. J. Newton Friend before the British Association, we notice a tribute to the knowledge of science possessed by the Druids. Credit for scientific achievements is so often given to Eastern nations, such as the Chaldæans and Assyrians, that one is glad to find that the ancient Druids in this country have been somewhat misjudged. In the popular mind they are chiefly associated with human sacrifices, though in this respect they were not more cruel, but possibly more humane, than the priests of other countries in primitive times. At any rate, according to Dr. Friend, they were far from illiterate. Young men were sent from the Continent to Britain to study with the Druids, whose knowledge was held in great esteem. They possessed a good knowledge of astronomy. A curious fact mentioned by Dr. Friend is that the misty atmosphere of British hills led them to invent the water-clock as a substitute for the sundial, the readings of which, though reliable in sunny climates, were frequently obscured by cloudy skies.

The Protection of the Eyes in Light-Therapy

The recent development of light-therapy has drawn attention to the design of protective glasses for the use of operators. The need for glasses has been realized in other cases, for instance in the case of arc-welders; but the requirements of the light-therapy operator are somewhat different. The problem is discussed by Mr. L. T. M. Gray in a recent number of *The British Journal of Actino-Therapy*. He remarks that the perfect glass for use in the operator's goggles should give protection against three quite separate effects, namely, ultra-violet rays, glare in the visible part of the spectrum and infra-red rays. The infra-red rays are transmitted by most glasses, and whilst there is no general agreement as to their action it seems safest to exclude them. Elimination of glare may be effected by tinting the glass, and most glasses which are effective in cutting out the ultra-violet are more or less coloured. At the same time it should not interfere too greatly with the vision of the operator, i.e., luminosity must not be too greatly reduced. Red glasses are in general safe, but, unless they are very thin, absorb too much light. Blue, blue-green and purple glasses all transmit considerable proportions of the ultra-violet. Most of the protective glasses sold under various names have a yellowish colouration and eliminate the more dangerous rays. For complete protection the transmission of lenses should not be greater than 1 per cent. for radiant energy of any wavelength shorter than 4060 A.U. It should be noted that ordinary spectacles are not sufficient, since a considerable amount of radiation may enter the eye by reflection off surrounding objects. Radiation entering the eye from below is specially dangerous. Goggles, affording complete protection, should therefore be worn. Useful data on various forms of protective glasses are to found in publications of the Bureau of Standards (Washington). We believe that some useful data on glasses of this description have also been published by Mr. M. Luckiesh.

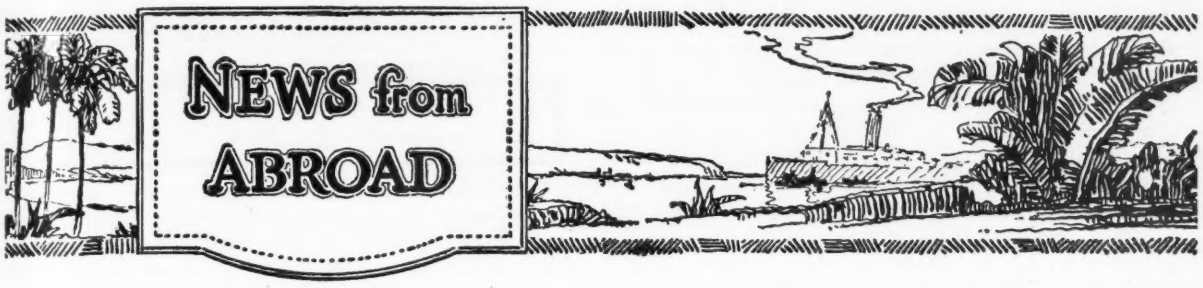
Electricity on the Farm

We understand that Mr. R. Borlase Matthews is reading a paper before the Tenth Harper Adams Poultry Conference entitled "Installing Electricity on Poultry Farms, or the Mechanical Problems involved in the Use of Artificial Lighting in Poultry Houses." In addition Mr. Matthews is presenting a paper on "Electric Ploughing" at the World Power Conference at Basle on September 5th, in connection with the Electricity in Agriculture Section ("D") of that Conference.

Obituary

Mr. F. Harrison Glew.

As we go to press we learn with great regret of the death of Mr. Harrison Glew, a member of the Illuminating Engineering Society, who was well known as one of the most indefatigable experimenters with radium and a very skilful manipulator of the self-luminous radio-active materials used for painting the dials of instruments and watches, etc. Mr. Glew rendered most valuable services in this special field during the war, at a time when there were few indeed in this country who had the necessary skill and knowledge. He had an enthusiastic interest in all these phenomena, on which he gave delightful illustrated lectures before many societies, including the Illuminating Engineering Society. Like many other experimenters with radium, he suffered the consequences of constant exposure to the rays, and his name must be added to the long list of those who have thus sacrificed themselves in the cause of science.



The Dutch Illuminating Engineering Society

We have received from our esteemed correspondent, Dr. N. Halbertsma, a copy of the Articles of Association of the Dutch Illuminating Engineering Society, the formation of which we chronicled in our last issue.* The constitution is framed on broad lines. Its chief objects are to promote knowledge of the use of light in any form, and to encourage co-operation between all who are taking part in this field of science. The Society is also to represent Dutch interests on the International Illumination Commission. It aims at achieving its objects by encouraging scientific research and by bringing the fundamental principles of good illumination before the public by means of lectures, demonstrations, and publicity, by the development of standardization, etc. The Society may be joined either by persons or corporate bodies. A committee is to be appointed to supervise the technical work carried out by the Society's Bureau. We shall watch the progress of this newly-formed Society with the greatest interest.

Recent Developments in Portable Lamps

There has recently been a marked development abroad in craftsmanship of lighting fittings, especially those of a small and portable nature for domestic use. In a recent contribution to the *Suddeutsche Elektro-Anzeiger* Margarete Bannerman comments on the extraordinary variety of materials now employed, and the constant striving after novel and artistic effects. Such media include alabaster, painted glass, lustres and pearls, and many new varieties of glass giving pleasing effects. Pressed paper and coloured paper are also being put into service and Japan is reviving the use of picture-silk for lighting fittings. Portable and basket lamps in great variety are being introduced, but the table lamp has been singled out for special attention. Some of these utilize delicately moulded figures as the support, the luminous element being incorporated into the design. Sometimes the lamp is combined with some other object, such as a clock, an hour-glass or an ash-tray. Yet another device is the use of artificial silk flowers, illuminated from within. Amongst the more costly lamps may be mentioned those of silverwork with delicate silk shades. There are signs of a return to the practice of the middle ages, when ornament was frequently lavished on a lamp so that it served as an artistic creation and a costly present.

The Measurement of Filament-Temperature of Incandescent Lamps

A survey of the above subject is included in a paper by M. G. Ribaud reproduced in the *Bulletin de la Société Francaise des Electriciens.* The author summarizes the essential qualities of a black body and presents a family of luminosity curves corresponding with black body radiation at different temperatures. A diagram of a typical pyrometer enabling the brightness of a filament to be determined by the "disappearance" method is given, and the author subsequently discusses the effect of departure from black-body radiation by a metal surface. This leads to several alternative definitions of the colour-temperature of an incandescent body.

* *The Illuminating Engineer*, August, 1926, pp. 230-231.

Competition in Shop Lighting

An interesting move in connection with shop lighting is reported in *The Electrical World*. Finding that Jewish merchants are more highly competitive than Gentiles as a rule, the sales manager of one electric service company adopted the plan of approaching Jewish merchants in different lines of activity, and with places of business fairly widely separated, so as to enable the effect of the improved lighting to be evident. It has usually been found that if one merchant improves the lighting of his windows, others in the vicinity imitate him before long. In many small cities the adoption of this plan has gradually led to a general advance in window lighting. Moreover the change reacts in other ways, for the fact of the window being brightly lighted causes the merchant to be dissatisfied with the interior lighting. Hence further improvements quickly follow.

The Use of Mirrors in Kinema-Projectors

It is common knowledge that useful results have followed the use of spherical mirrors situated behind the source in kinema projectors. In some cases this has even enabled the condenser lens to be eliminated. The chief field for such mirrors, however, appears to be in connection with the smaller projectors, for which special gasfilled electric incandescent lamps can be used. One familiar function of such mirrors is to cause the image, formed at the focus, to be superimposed over the actual filament, helping to form what is optically a continuous source. The possibilities of such mirrors have been studied in detail in an instructive recent contribution to *Licht und Lampe*, by Otto Reeb and Felix Bobek. A number of different arrangements are shown, and their relative advantages analysed. We have first the simple substitution of the lens-condenser by a spherical mirror placed behind the source, as above described. Such a mirror may, however, be combined with a plano-convex condenser of a simple form. A novel device is a second small supplementary mirror, which is placed between the source and the condenser, and reflects light back on to the main mirror behind the source. Calculations and observation suggest that the luminous efficiency of the projector is materially increased by this means. The secondary mirror has presumably a further advantage in causing another image of the filament to be formed at the common focus, thus again assisting coalescence into a continuous source.

A Lighting Scheme in Jerusalem

According to *The Electrical World* a British Company is being formed in London to purchase a concession for the lighting, traction and water supply of Jerusalem. The Anya River, near Jaffa, is mentioned as the source of water supply and it is expected that the work on the electric lighting will be commenced in October.

Thus it seems likely that before long the time-honoured and primitive illuminants of the East will give place to modern methods. In many Eastern and Near Eastern countries there should be quite noticeable developments in illuminating engineering during coming years.

The Penetration of Light into the Sea

Much contradictory information has often been published regarding the transmission of light by water. Some interesting facts are recalled in a recent communication by Messrs. W. R. G. Atkins and H. H. Poole, of the Marine Biological Laboratory, Plymouth, to *Nature*. According to these observers, absorption by water is affected by four distinct conditions: (1) the effect of pure water itself, (2) the scattering effect of relatively large particles, (3) the scattering effect of very minute particles in suspension, and (4) the selective effect of colouration of the water. The effect of (1) is chiefly to absorb the longer wavelengths. As is well known, water-lenses have a powerful effect in checking heat, but pure water allows ultra-violet light to pass with surprising ease. The scattering effect of large particles (2) reduces illumination of all wavelengths, whilst the effect of very minute particles (3) has most effect in checking the short wavelengths, i.e., the blue, violet, and ultra-violet. The selective effect (4) naturally depends on the tint with which the water is imbued. These facts are of some importance in connection with the growth of minute plant life; here the depth of layer of water through which light penetrates may prove a controlling factor. In a contribution to the *Journal du Conseil International pour l'Exploration de la Mer*, published in Copenhagen, Dr. Atkins refers in detail to this question, drawing attention to the marked diminution in transparency that occurs as one approaches land. One can imagine that the ease with which light can penetrate water, owing to its effect on small growths on which fishes feed, may be of material consequence to the fisheries.

Domestic Lighting and the Revenue of Electric Supply Undertakings

We commented in our last number on some striking data presented in the United States showing that domestic lighting, while forming only a relatively small fraction of the total load of supply undertakings, forms a very much larger proportion of the *revenue* received. This is again illustrated in other reports on progress in the field of residence lighting abroad. One of the most striking facts has been the realization by supply undertakings that the domestic field has been much underrated in the past and that great opportunities for expansion—in the lighting field as well as in other domestic applications of electricity—now exist. We shall have occasion to return to this matter in our next (October) number when we propose to devote a special section to the Lighting of the Home.

The Translucency of Porcelain

The quality of fine porcelain is largely associated with its delicate translucence. An expert will judge this by eye, but we notice that Messrs. C. W. Parmelee and P. W. Ketchup, in a recent investigation into the causes of translucence of porcelain, made use of the Lummer-Brodhun photometer and the photo-electric cell as an aid to their impressions. The results are communicated in a bulletin issued by the University of Illinois Experimental Station. The reddish colour of the transmitted light is something of a difficulty, but nevertheless photometry proved useful. Translucency is largely a matter of the thickness of the material, and diminishes according to the usual exponential law. Increased content of fluorspar or flint also increases translucency, whilst a high clay content diminishes it. Fine grinding of materials and a relatively high firing temperature are also favourable to high translucency. This research furnishes a typical instance of the application of photometry to industrial problems. There must be many other trades concerned with the production of articles making an appeal to the eye where a study of contrast or transparency by photometric methods might lead to useful results.

Obituaries

FRANKLIN S. TERRY.
Born May 8th, 1862. Died July 22nd, 1926.

We record with regret the death of Mr. Franklin S. Terry, one of the pioneers of the electric lamp industry in the United States, on July 22nd. Very early in his career he organized the Sunbeam Incandescent Lamp Company of Chicago, which was ultimately absorbed by the National Electric Lamp Company, which in 1911 was merged with the General Electric Company. Mr. Terry was one of those who early foresaw the advantages of standardization in the lamp industry and the benefits of amalgamating the large number of small struggling companies that formerly existed. From 1911 onwards Mr. Terry acted with Mr. B. G. Tremaine as managers of the National Electric Lamp Works of the General Electric Co. at Nela Park. At the time of his death he was also a vice-president of the General Electric Company. He was one of the organizers of the National Electric Light Association, when that body was founded in 1885, and he took an intimate interest in the work of the Nela Research Laboratory at Cleveland, Ohio.

Mr. Terry had a great liking for outdoor life and was largely instrumental in the founding of "Association Island," which, besides serving as a place of rest and recreation for employees, is used for many electrical meetings and conferences during the summer season.

The writer has a very pleasant recollection of a visit to Association Island when one of these periodical conferences was in progress, and of a subsequent voyage across the Atlantic in company with Mr. Terry when the latter came over to Europe to study developments. Mr. Terry was primarily an idealist, but he combined with his idealism strong practical sagacity, and to those who knew him he was a most sympathetic and kindly companion. He was a strong believer in all those associated with illumination getting to know each other, and devoted himself assiduously to the encouragement of friendships between those in similar walks of life.

MR. CHARLES A. COFFIN.
Born December, 1844. Died July, 1926.

A great figure has been removed from the American electrical industry by the recent death of Mr. Charles A. Coffin, who was President of the General Electric Company from its organization until 1913. During his long connection with this vast company Mr. Coffin did a great deal towards the stabilizing of the electrical industry, combining great financial ability with a wide outlook and courage in introducing new apparatus. After his retirement the directors established the Charles A. Coffin foundation in his memory—a fund which has been applied to the encouragement of invention and services to the electrical industry, etc. According to this foundation a gold medal is awarded annually to the electric light and power company considered to have made the greatest contribution towards developing practical applications of electricity. Mr. Coffin was a man of big ideas. He foresaw that ultimately applications of science in the service of mankind would lead to decentralization, not only in regard to material advantages, but in mental culture and opportunities. He had a keen recognition of the value of electricity as a social agent and a unifying force, and a great belief in the necessity for intercourse between engineers in different countries and the formation of international relations. Although best known to engineers through his association with the General Electric Company, Mr. Coffin had widespread interests and was connected with many financial and industrial concerns, besides taking a keen interest in art and education.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The British Association for the Advancement of Science

Ninety-Sixth Meeting, held at Oxford, August 4–11, 1926

THE meeting of the British Association has this year attracted an unprecedented amount of attention, and has doubtless served its purpose of stimulating public recognition of the value of science. One of the chief features this year was the delivery of the Presidential address by H.R.H. The Prince of Wales on August 4th.

SCIENCE AND THE STATE.

The Prince, in his address, traced the relations between science and the State in this country. He recalled the second meeting of the Association, held in Oxford in 1832. At that time science did not receive the general recognition it has since won. In fact, Keble, expressing the resentment of a section of the University at the bestowal of honorary degrees on certain eminent scientists, referred disparagingly to the "hodge-podge of philosophers" thus honoured! This "hodge-podge" included some very distinguished names—David Brewster, Robert Brown, John Dalton, and Michael Faraday. Each of these men has left his mark on the history of his own special department of science. Brewster's researches into optics were his greatest scientific achievement, Brown's services to botany were unsurpassed, Dalton's name is for ever associated with the atomic theory. Faraday's labours provide one of the most wonderful examples of scientific research leading to enormous industrial development. It is said that two million workers in this country alone who are dependent on electrical industries are living on the brain of Faraday; but to his discoveries many millions more owe the uses of electricity in lighting, traction, communication, and industrial power.

The influence of science on the daily life of the community has also done much to remove the mistrust of it, as being somehow allied to the Powers of Darkness. Yet as late as 1859 science was still in a humble position. The Prince Consort, as President in that year, expressed the hope that "by the gradual diffusion of science and its increasing recognition as a principal part of our education, the public in general, no less than the Legislature and the State, will more and more recognize the claims of science to their attention, so that it may no longer require the begging-box, but speak to the State, like a favoured child to its parent, sure of its parental solicitude for its welfare."

The position foreshadowed in these words has now been in a large measure attained. Progress was visible towards the end of last century in the establishment of the National Physical Laboratory, whose researches have since been of great value to many Government Departments. In historical sequence comes the Development Commission, established in 1908. The Rothamsted Station has developed its work to include the study of the whole field of nutrition and disease in the plant, with valuable results to agriculture.

Next in historical sequence we have the medical Research Committee, established in 1913 (now the Medical Research Council). Under the new conditions the State is actively concerned with the promotion and co-ordination of medical research towards the conquest of infirmities. As examples of progress the Prince referred to insulin, the discovery of vitamins, and the sunlight treatment. He alluded to the hope of penetrating the secret of cancer, as a result of recent microscopical researches. Closely linked with the discovery of vitamins has been the recent development of knowledge regarding the relation of sunlight to health. Sunlight, or its artificial equivalents, have some importance already in the treatment of disease; a realization of its significance for health has a much greater importance in preventive hygiene. But patience and caution are as necessary as ever and exacting technique is in process of development.

Turning to the part played by science in the Great War, the Prince pointed out that if applications of science had added to the distresses of warfare they had also helped in their alleviation. The creation of the Department of Scientific and Industrial Research was an act which falls historically within the period of the war, but was an outstanding incident in the scientific advancement of national affairs. By an odd freak of history it needed the whole period of a century between one great wartime and another—from the Napoleonic to the Great War—to mature the conception of a State Department of scientific research. In this connection the Prince referred to the fear expressed when the Department was originated that the freedom of research might be imperilled; but modern developments had dispelled this fear. The progress of science cannot be kept entirely within training walls, and no one wants to keep it so. Various applications of the work of the Department were mentioned, special reference being made to that of the Building and Food Investigation Boards, as instance of a matter of vital import to daily life.

A feature of all this work was the co-operation with various centres of research, such as the National Physical Laboratory and the laboratories at Oxford and Cambridge. At Cambridge a University low-temperature research station has been established. Other directions of research which touch upon commonplaces in our daily life are those concerned with fuel, illumination, and with the deterioration of fabrics and the fading of colour stuffs.

In conclusion, the Prince referred to activities in the Dominions and Colonies, which were themselves actively engaged in research, and recalled that Sir William Huggins, in his Presidential address to the Royal Society in 1901, had remarked that "assuredly not only the prosperity but even the existence of this Empire will be found to depend upon the more complete application of scientific knowledge and methods to every department

of industrial and national activity." To-day we see that application in much fuller progress than when Huggins spoke only a quarter of a century ago, and already we know how truly he prophesied.

Engineering and Technical Problems.

The very large number of papers read in the different sections was calculated to illustrate the wide range of modern science, but renders it impossible to do more than briefly mention some of those most likely to be of interest to our readers.

In the Engineering Section chief interest attaches to the Presidential address by Sir John F. C. Snell on "The Present and Future Development of Electricity Supply." Sir John traced in detail the various stages of progress from 1889 onwards. A striking comparison was made between some figures put forward by Colonel Crompton 32 years ago and those applying to-day. The ideal cost of production was then assumed to be 1·32d., excluding capital charges, and the average price to consumers 3d. per unit; the load factor was taken at 20 per cent., and the capital outlay at £125 per kilowatt installed. At present the average revenue from all classes of consumer is 1·75d. per unit, the average station load factor 29 per cent., and the capital outlay £52 per kilowatt. It has been estimated that between the next 15 years the output of electricity in Great Britain may reach 21,000,000,000 units, and the author showed that there was every reason to expect that this figure might even be exceeded. Assuming an average price per ton of coal delivered to supply stations at 20s. per ton, it is safe to say that the *average* price at which electricity should be available within a few years should be under 0·90d. per unit. This might be expressed in the following terms when applied to various classes of consumers:

Alternating current energy transmitted in bulk to large consumers, such as railways and large industries, from 0·5d. to 0·25d. per unit; alternating current energy distributed locally for general domestic purposes, including lighting, about 0.8d.; lighting only, about 2d.; small power supplies, about 1·25d. per unit.

In the concluding part of the address special reference was made to rural development, to the pioneer work in this field of Mr. Borlase Matthews, and to the valuable research work being conducted by the B.E.A.M.A. Research Association, the National Physical Laboratory, the Fuel Research Board, and other bodies.

Mr. Borlase Matthews himself also contributed a survey of progress made in electric ploughing, and the problem of refrigeration applied to the transport of foodstuff from abroad was also discussed. A paper dealing with Mass Production of Motor-cars was read by Mr. A. A. Rowse (Morris Motors), who illustrated his remarks by films showing processes of assembly. It was mentioned that in a Morris car there are as many as 10,000 parts, so that the complexity of the problem can be imagined. Mr. H. E. Wimperis dealt with the "Auto-Giro," or the rotating wing in aircraft, and discussed the future possibilities of safe and rapid vertical ascents and descents by the helicopter type of machine.

In another section a paper was read by Mr. A. Stephenson on Accidents in Industry. It was mentioned that in the United States accidents cost a billion dollars annually. It is estimated that 85 per cent. of these accidents are preventible, and the author suggested various methods of training employees entering industries, which may help. Amongst these may be mentioned practice on dummy machines, so that correct and safe motions may be acquired.

Physical and Mathematical Science.

One of the most interesting items in this section was the address by Professor A. Fowler on Spectral Analysis. Nothing is more remarkable than the manner in which the applications of spectroscopy have broadened out. Originally serving as an aid to chemical research, it enabled us to obtain some knowledge of elements present in distant suns and stars; but at the present day it is also enabling us to make deductions as to their physical properties. Applied to chemical substances, it may yield information on their properties, for instance their valency, besides identifying them. Professor Fowler foretold that in the future it might be possible—so closely are the properties of elements and their spectra related—to calculate the lines in the spectrum more exactly than they can be observed.

The X-ray analysis of crystals was dealt with by Sir William Bragg and his son, and Sir Ernest Rutherford and Dr. Chadwick surveyed recent work on the bombardment of atoms with alpha rays. A paper by Mr. W. W. Garret dealt with the fascinating problem of the transformation of elements by low-voltage discharges, referring particularly to the reported transmutation of mercury into gold. The earliest example of transmutation was the artificial production of helium and neon in X-ray tubes in 1912, reported by Ramsay, but apparently still the subject of discussion. Another case is the transmutation of mercury into gold, announced by Miethe in 1924. Other workers have reported results of a similar nature, though the amount of gold and silver obtained was minute. The author's own researches, however, have not yet confirmed the effect.

An interesting paper by Mr. R. Campbell Thomson on "Science of the Assyrians in the Seventh Century B.C." showed that at this early time quite substantial scientific knowledge existed. Comprehensive botanical lists and medical prescriptions have been found amongst remains, and the acquaintance of the Assyrians with mathematics and astronomy was considerable. They could, for instance, foretell lunar eclipses. It is probable that our day of 24 hours and our hour of 60 minutes were of Babylonian origin.

Finally, we may note the contribution of Professor H. H. Turner dealing with the total eclipse of the sun which is to take place soon after sunrise on June 29th, 1927. A total solar eclipse has not been visible in this country for 200 years, and even this one is of very short duration. Astronomers will only have 20 to 25 seconds in which to make their observations. The eclipse will be total on a line extending from Southport to West Hartlepool.

Education.

The place of science in education was the subject of a discussion in Section L. A noteworthy contribution was that of Professor C. H. Desch, of Sheffield University, who deplored the tendency towards specialization. More attention should be paid to the history of scientific thought and discovery in order to broaden the outlook, and there was a place for the history of science in the general training of students in arts and sciences. At present the old idea of a liberal education is being lost sight of, and graduates of science may reach a high standard in their special subject whilst remaining profoundly ignorant of literature and history.

Sir Thomas Holland, in his discussion of Methods of Science Teaching, drew attention to the advantages of the "Tandem" system adopted at the Imperial College of Science, whereby students are allowed to deal in succession with their various subjects, acquiring a thorough mastery of each, instead of attempting the study of a number simultaneously.

Interesting contributions were by Dr. C. W. Kimmins on "The Cinema in Education" and Mr. J. C. Stobart on "Teaching by Wireless." The educational possibilities in both cases are very great. Dr. Kimmins described the preparation of educational films at Yale University, and allusion was made to the value of the film in recording great events, such as Arctic exploration and the ascent of Mount Everest. Wireless offers the method of education by which the largest possible number of people can be instructed simultaneously. In the discussion an interesting account was given of the part played by broadcasting in Nigeria, where practically all the natives are dependent on the spoken word.

Miscellaneous Subjects.

The foregoing represent only a few out of a very large number of papers of a more or less directly technical and engineering character. In other fields of science there were many contributions dealing with outstanding

fundamental problems. Of these, the discussion opened by Sir Daniel Hall on "Population and Food Supply" was arresting. From the evidence available, the problem seems at the moment both menacing and insoluble. It would appear that the development of food-producing areas cannot keep pace with the increasing population. The chief consolation is that the problem is an old one, and that earlier investigators foresaw a crisis even before present times. It may be hoped, therefore, that science will ultimately enable us to intensify present methods of food production, and to find others, and thus to stave off danger again in the future.

Professor H. F. Osborn, in opening the proceedings of the Section of Zoology, dealt with the "Origin of Species." Other papers which have excited considerable comment were those of Sir Josiah Stamp on "The Inheritance of Wealth" and of Sir Lynden Macassey on "Some Economic Aspects of the Labour Outlook."

There was quite a series of papers dealing with Racial Evolution, the Future of Native Races, and kindred problems. There were accounts of the discovery of the famous Neanderthal skull by Miss Garrod, of cosmetics other objects found in Tutankhamen's tomb, of excavations in Sparta, and of discoveries in the great Gobi Desert.

These and other papers showed the far-reaching field of modern science. The wide disseminations through the press of information presented on the most diverse subjects should help towards the correction of the tendency towards "over-specialization" to which several of the contributors referred.

The 13th Edition of the "Encyclopædia Britannica"

ILLUMINATING ENGINEERING TREATED.

The Specimen Book of the 13th edition of the *Encyclopædia Britannica*, which has just reached us, is in itself quite a *tour de force*. It is well designed to excite interest in the new edition and illustrate the skill with which it has been prepared under the able editorship of Mr. J. L. Garvin. Those responsible have been successful in enlisting the aid of many famous statesmen, scientists and scholars. There are to be 193 articles on the War, and Marshal Foch, General Sir Ian Hamilton, Major-General Sir Frederick Maurice and many other famous commanders will write on aspects coming within their supervision. Art, literature, science, and sport are similarly treated, and we observe, as a characteristic "scoop," that Trotsky is to contribute the biography of Lenin. The Specimen Book is very fully illustrated, some excellent colour-plates being included. Glancing through it one is impressed by the important part that science and engineering will play in the coming edition. One is glad to note that Illuminating Engineering is not overlooked, the survey of this subject being contributed by Mr. L. Gaster, Hon. Secretary of the Illuminating Engineering Society.

The Illuminating Engineering Society (U.S.A.)

Twentieth Anniversary Convention

WE have now received the published programme of the twentieth anniversary convention of the Illuminating Engineering Society in the United States, which is being held in Spring Lake, New Jersey, during September 7th-10th.

As already mentioned, the convention this year is of special interest as marking the completion of 20 years' work. This fact is duly recognized in the programme by the inclusion of an entire session depicting "Twenty Years of Lighting Progress."

We propose to give a review of this varied series of papers in our next issue, and meantime we have pleasure in presenting an abstract of the Presidential address by Mr. M. Luckiesh, which will be found in the following pages (pp. 260-264).

The programme of events is as follows:—

TUESDAY, SEPTEMBER 7TH.

9-0 a.m.—
Registration.

2-0 p.m.—
Address of Welcome—Thomas N. McCarter.
Response to Address of Welcome.
President's Address—M. Luckiesh.
Report of General Secretary—L. H. Graves.
Report of Headquarters' Extension Bureau—G. H. Stickney.
Report of Committee on Progress—F. E. Cady.
Paper: A Basis of Rating for Measuring the Quality of Street Lighting Service—A. J. Sweet.

WEDNESDAY, SEPTEMBER 8TH.

9-30 a.m.—
Paper: Lighting and Contrast—P. W. Cobb and F. K. Moss.
Paper: Lighting a Ballroom for Championship Tennis—Ward Harrison and P. R. Holmes.
Paper: Light in Medicine and Surgery—Dr. Herman Goodman.
Paper: Underwater Illumination—W. A. McKay and S. G. Hibben.

1-0 p.m.—
Golf Tournament.

Evening—
It is planned to have a lecture of a popular nature on some scientific subject related to lighting by a speaker of national repute.

THURSDAY, SEPTEMBER 9TH.

9-30 a.m.—*Natural Lighting Session.*
Paper: Making Your Windows Deliver Daylight— W. C. Randall and A. J. Martin.
Paper: Transmission of Light Through Window Glass—E. H. Hobbie and W. F. Little.
Paper: Natural Lighting in Schools—A. F. Beal.
Paper: Relative Effectiveness of Various Methods of Control of Light Through Windows—H. H. Higbie.

2-0 p.m.—*Lighting Service Committee Session.*
Four sections of the Lighting Sales Manual prepared by a joint committee of the I.E.S. and N.E.L.A. will be presented as follows:—
Organization—Presented by W. T. Blackwell.
Activities—Presented by J. F. Mayo.
Equipment—Presented by J. P. Campbell.
Engineering—Presented by R. B. Brown, Jr.

FRIDAY, SEPTEMBER 10TH.

9-30 a.m.—*Twenty Years of Lighting Progress.*
The Science of Light and Vision—E. C. Crittenden.
Concepts, Units and Standards—C. H. Sharp.
Commercial Lighting—Norman Macbeth.
Industrial Lighting—J. R. Cravath.
Street Lighting—P. S. Millar.
Lighting in Transportation—G. H. Stickney.
Lighting Education—S. E. Doane.

2-0 p.m.—
Paper: Lighting of the Sesqui-Centennial International Exposition—D. W. Atwater.
Paper: Art and Utility in Church Lighting—J. L. Stair.
Paper: An Investigation of the Reliability of the "Ii" Test—M. Luckiesh, P. W. Cobb and F. K. Moss.
Paper: Intensity of Light and Speed of Vision Studied with Special Reference to Industrial Situations—C. E. Ferree and G. Rand.

PRESIDENTIAL ADDRESS

By M. LUCKIESH

(Abstract of Presidential Address delivered before the Twentieth Anniversary Convention of the Illuminating Engineering Society (U.S.A.), Spring Lake, N.J., September 7th-10th, 1926.

At this twentieth anniversary of the Illuminating Engineering Society it is befitting that we look backward as well as forward. In the past score of years we have made much progress, and we may look upon our accomplishments with pride. However, the past should not merely serve as a source of pride or of confidence in the future. The past is never a certain assurance of a prosperous future. For proof of this we need only to review the casualties of once prosperous business enterprises. An excellent use which we can make of the past is to profit by the mistakes and neglected opportunities and to review the trend of our activities. A periodic appraisal should be made of our efforts, our organization, our relation to humanity and to business, and of the work to be done. I shall review briefly some of the phases which, in my opinion, should make this Society grow and extend its helpfulness. At least with this background each one of us may survey the present to better advantage and try to determine our value and what our future trend should be. It would be easier for me to treat some specific subject or to present a few generalizations, but it seems to me this address may logically be devoted to important phases of our activities and organization.

Our Existence.—None will deny that such a society as this was needed twenty years ago. Our first President, Mr. L. B. Marks, in his Presidential address in 1906, stated, in effect, that illumination as compared with the development of the production of light had been neglected. Since that time the production of light has continued to outstrip the utilization of light. Since the inauguration of this Society the tungsten lamp appeared and ductile tungsten was developed, which greatly increased the controllability of artificial light. Another great stride in the efficiency of light-production was made with the gasfilled tungsten lamp. This replaced more complex light-sources, and the resulting simplification greatly increased the possibilities of artificial light. Therefore, there is even a greater need than ever before for such work as this Society does. Science is always ahead of practice and usually is far in advance. We have no cause to doubt the need for the work of such a Society as this. Our greatest concern should be confined to the development of an organization and to the revision of our policies, if necessary, to fill this need as efficiently and as completely as possible.

This Society has no right to exist unless it is rendering a needed service to civilization. It will not grow and prosper unless it continues to render such a service effectively. Leadership is maintained only through doing a necessary work in the most satisfactory manner. This Society must have well-defined aims, peculiarly its own, which contribute eventually to the happiness of mankind. In order to do its work adequately it must utilize at least all the major channels available. It must have the necessary funds, organization, leadership and confidence in its mission and in its ability. Excuses in respect to any of these are not proper substitutes for the real thing.

Our Complex Work.—No organization has a more complex viewpoint and a more complicated work to do. Our interests are as extensive as vision itself. They lead us wherever light is used to increase the efficiency, the production, the safety, the comfort, and the happiness of mankind. Although this complexity renders our task very difficult we may capitalize it by making our entry or our appeal along the many threads in this intricate web. Being confronted with a complexity which leads into many fields such as physics, physiology, psychology, sociology, ophthalmology, economics, commerce, industry, engineering, public safety, and æsthetics, let us take advantage of this variety. We may appeal to philanthropic spirit, to humanitarian sense, to economic gain, to commercial prestige, to national supremacy, to individual advantage and to scientific advancement. All these are legitimate means to a desirable end. Of what concern is the *means* if it is a legitimate one? It is the *end* which we should fix our eyes upon.

Our Name.—It is with reluctance that I open a subject which has not been officially opened for so many years. Furthermore, I realize the difficulties involved in changing a name which has been in use for a score of years. Therefore, be it understood that I touch upon this matter merely to complete this brief critical survey of some of the salient features of the Society and to present a full perspective. Of course, one finally becomes known and is appraised by his achievements, but only the impractical idealist insists that "there's nothing in a name." An unfortunate, inappropriate, inadequate, or misleading name for a product or an enterprise is a handicap which may eventually be removed by a widespread acquaintance with the value and accomplishments of the product or enterprise. This Society has not achieved a very extensive recognition of its value or work.

We need not consider whether or not the name was satisfactory twenty years ago. Certainly during this period the scope of lighting has greatly expanded. It now extends far into æsthetics, optics, vision, economics, and sociology, and, consequently, it has far outgrown the realm of physics. Certainly the word *Engineering* is misleading, inadequate, and restrictive. The aims of this Society deal relatively little with what is commonly implied by the term *engineering*. The handicap of this word in the name of our Society is constantly evident to those whose interests extend beyond the more directly engineering phases into the many byways of the scientific and æsthetic aspects of our work. Perhaps the word *Engineering* might be dropped from the name of our Society without much confusion and with some advantage. Perhaps such a name as THE ILLUMINATING SOCIETY would not be chosen if our Society were now being initially christened, but it may be a satisfactory compromise. To me the term *lighting* is of much broader scope than the term *illumination* or the phrase *illuminating engineering*.

I believe the present name to be one of the mistakes of the past—easy to recognize now but, perhaps, quite natural a score of years ago. The handicap of an unsatisfactory name may now be of less consequence than the difficulty and the confusion involved in its change. However, I doubt that this is true. Our name is not accurately impressed very far beyond our own membership. The change would be most conspicuous among our own members, where it should be readily understood and assimilated. Of course, after this Society has existed for half a century and has established itself far and wide, the handicap of a restrictive and misleading name would be largely removed. But do we wish to go on with the present name?

Our Aim.—The primary aim of this Society, as printed upon the cover of the TRANSACTIONS and other official publications is as follows:—

> "*. . . . the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto.*"

No serious difficulties are involved in the alteration of this statement. Therefore, I suggest that consideration be given to the substitution for the words *illuminating engineering* something more inclusive of the scope of the

work and of the opportunities of the Society. Either *lighting* or the *use of light* might be satisfactory substitutes or, at least, compromises.

Assuming for the present that we substitute the term *lighting*, and referring again to the aim as quoted from our official publications, we may further conclude that *theory* is of interest to us merely as a means to an end. Therefore, our ultimate aim might be expressed as,

. . . *the advancement of lighting practice.*

Let us keep this goal clearly in mind.

Our Transactions.—As we look over twenty volumes of our TRANSACTIONS we find that we have steered our course—the advancement of lighting practice—fairly well. Furthermore, we find that we have learned much in these twenty years, and that there is a steady increase in the percentage of papers bearing directly upon lighting practice. In the early volumes there is much evidence of feeling our way. Many of the early papers are dominantly theoretical, or of a distinct "scientific" flavour, but it is an excellent sign that as the years passed more and more papers are of a "practical" nature. This indicates that we not only have had our goal in sight, but that we have progressed toward it.

Certainly with space and facilities limited, no "extraneous" material should be admitted to the TRANSACTIONS. Highly specialized subjects should be accepted only rarely, and then only if concisely written. Material of a "textbook" character should be left in the textbooks; references and brief statements are enough. Long detailed accounts of purely scientific researches belong to the scientific journals. If the author has proper standing to make his work worth while, such accounts will be readily accepted by scientific journals existing for that purpose. Interesting summaries of such researches written as much as possible from the viewpoint of lighting practice should usually suffice for the TRANSACTIONS. We want such foundational material, for it is the most valuable we can have, but few of our members desire to read detailed accounts. It also seems to me that we have passed the time when papers consisting of generalizations are acceptable. Finally, those papers which do appear should not only be concisely written, but the percentage of space devoted to different subjects should, as a rule and as far as practicable, be representative of or proportional to the relative interest of the membership.

My object in discussing the TRANSACTIONS is manifold. This publication is the principal means of maintaining the interest of the members, and, of course, is the principal means of appraising the value of the Society. I would like to see its space utilized solely for material of live interest along the line of our aim. A step was made this year toward enlivening the TRANSACTIONS with more news items and abstracts, and they are now open for brief papers which have not been presented before a Section or the Annual Convention. Still more attention should be given to enlivening the TRANSACTIONS with interesting and timely material.

Our Membership.—In the light of our small membership and very limited facilities, our achievements are very commendable. But it is dangerous to confine ourselves to this view. The great work to be done should not be lost sight of. By contrast with the latter, our achievements are dwarfed and our membership is woefully small. When we consider the very wide scope of our interests—as extensive as vision—can we view with satisfaction and content an enrolment of about 1,600 members? Furthermore, there is cause for reflection in the fact that our membership has not appreciably changed in number for a decade. And this notwithstanding excellent efforts on the part of the Membership Committee during recent years, and also notwithstanding an enormous increase in lighting interest throughout this country and the world in recent years. An appreciable net increase has taken place this year which, if it could be maintained, would represent a healthy growth. However, the relatively constant total membership during the past decade indicates that for some reason we have reached a saturation point for the condition or set-up which now exists. I believe the present total membership represents only a small portion of what it can be if we so direct our activities as to utilize every legitimate means of advancing lighting practice. This Society is young and the science and art of lighting practice has barely begun; still the Society has ceased to grow. I believe the difficulty and the remedy are revealed in these paragraphs.

Our Organization.—I do not believe there is a technical society in existence in which a group of members contribute their time and knowledge more generously than in ours. The achievements of our Society are largely due to the co-operation and generosity of a small percentage of the membership. Certainly I have nothing but praise for them. Nevertheless, our organization is inefficient and inadequate. I believe the lack of growth of our membership roll and the limitations upon our accomplishments and prestige can be laid to an appreciable extent at the door of our organization.

Our general office with its very limited facilities is doing excellent work, and it provides a certain continuity from year to year in the mechanical operation of the Society. Our General Secretary usually ensures a certain degree of continuity, as well as some of the other officers and committees. However, in my opinion, we need a larger organization at headquarters. We must go forward or we shall eventually go backward. If we do not organize to develop our increasing opportunities we shall find other organizations gradually invading our field. Already we have seen others doing what we should have done. I should not be surprised to have someone reply to this to the effect that "it makes no difference who does it just so it is done." I shall reiterate that our only excuse for and possibility of existence is to do our work. And while our task is constantly growing larger it is also becoming more clearly defined in our own mind. If you accept my analysis it is very clearly defined as *the advancement of lighting practice.*

In looking over the Presidential addresses for the past twenty years it was noted that in ten of them the desirability of educational work was stressed. The dissemination of knowledge is stressed in the aim of the Society as at present worded. This is extremely important, and our codes and smaller pamphlets are a part of this work. An adequate headquarters organization could carry on this work much further by broadcasting our material into far-reaching publications. It could establish more definite and permanent co-operation with other organizations. In many ways it could provide continuity from which the Society would profit by a steady accumulation of momentum.

Our Future.—We have the satisfaction and the advantage of being associated with one of the primary essentials for human progress and happiness. We also enjoy the position of dealing with a science and an art in their infancy, for the great possibilities in light-control were born in this century. It has been adequately proved that there is great profit in good lighting throughout civilized activities. We have already glimpsed great promise in the æsthetics of light. We know that proper and adequate lighting increases the efficiency, the production, the safety, the comfort, and the happiness of mankind. On every hand we see light misused. Inadequate and improper lighting are still the general rule. In general, the user of light does not possess a lighting consciousness. We know what our work is, and we find it everywhere. What greater opportunity could we ask for! This Society has done a commendable work, but I believe that additional progress lies in the directions pointed out in the preceding paragraphs.

In Conclusion.—In keeping with my plea for the conservation of our time and facilities, I have confined my remarks to a critical survey of phases which appear to me to need consideration. For this reason, this address may seem pessimistic. However, I wish to emphasize the fact that we have much to be satisfied with. Fine work is continually in progress, but when time and space are limited we must let these satisfactory phases pass unsung. Many of our valuable activities have been continued this year. New activities have been initiated

which should bring credit to our Society and advance it toward its goal. I am grateful for the earnest support and fine co-operation of the officers, committees, and of many individuals. Naturally, the major work of the Society falls to the lot of a relatively few members. However, each member can contribute by obtaining other members, and in many ways can aid the Society in his community. There are opportunities on every hand for everyone.

The Economics of Lamp Choice

A USEFUL paper under the above title was recently communicated by Mr. D. J. Bolton to the Institution of Electrical Engineers. It analyses a problem of some importance to the consumer—the determination of the most economical efficiency at which an electric incandescent lamp should be run, bearing in mind the resulting life, cost of lamp and cost per unit of electrical energy.

The choice of lamp resolves itself into (1) the choice of type and wattage, and (2) the choice of rating (i.e., the voltage and corresponding efficiency). Broadly speaking, it is understood that the higher the cost of lamps and the lower the cost of electrical energy the less is the most economical efficiency (defined in terms of lowest cost to the consumer). Mr. Bolton studies the question analytically, and derives a series of curves relating cost to efficiency. The conditions can be expressed in algebraical form by the relations:—

$$R^{12\cdot5} = 0\cdot202\frac{PW_n}{C}$$

when the same lamps are used, the pressure being varied, and

$$R^{16\cdot1} = 0\cdot15\frac{PW_n}{C}$$

when a fixed size of illumination unit is used.

Here R is the ratio between the actual pressure and the rated voltage of the lamp; W_n the watts consumed; P is the price of energy in pence per unit; and C is the first cost of the lamp in pence for lamps having a normal life of 1,000 hours.

As a practical case, one may take the case of a vacuum tungsten lamp rated at 40 watts and costing 2s. Applying the second formula, we have

$$\text{Ratio, R, } = \frac{0\cdot15 \times 1 \times 40}{2 \times 12} = 0\cdot917,$$

i.e., 91·7 per cent. of normal pressure, with energy at 1d. per unit. Similarly R works out to 1·00 with energy at 4d. per unit, and 1·035 with energy at 7d. per unit. Professor Bohle, in his book on "Electrical Photometry and Illumination," finds that when energy costs 4d. per unit a 60-watt lamp, costing 2s.6d., is most economical on its normal rating, giving 1,000 hours' life and taking 1·2 watts per mean horizontal candle-power. When energy costs 6d. per unit it is economical to overrun the lamp until it takes only 1·03 watts per candle-power; whilst with energy at 2d. per unit the specific consumption should be 1·35 watts per candle.

It is clear that the larger or less expensive the lamp the more it should be overrun, and the shorter should be the life aimed at. It is pointed out that with energy at 4d. per unit any lamp in which the lamp size in watts divided by the price in shillings exceeds 20 should be overrun. With a 60-watt lamp costing 2s. 3d. the best life works out to 882 hours. On the other hand, with a 20-watt lamp costing, say, 2s. 6d., the most economical life will be 2,230 hours.

The variable cost of energy is chiefly a matter for the consumer to study, but lamp manufacturers could help him by grading their lamps for dear, medium, or cheap energy, somewhat on the lines of the "three-voltage" rating. It may also be noted that the B.E.S.A. Specification permits deviations in efficiency of about 6 per cent. on either side of the specified normal, and when these variations occur the consumer might be given the opportunity of choosing them in place of the normal lamps. In this analysis the fact that the filament deteriorates to some extent, according to the efficiency at which it is run, has not been taken into account. With the modern tungsten lamp this deterioration is much less than for the older types, and it is rare for a lamp to last until it becomes uneconomical on account of diminished efficiency. It appears that the effect of this consideration on the values of the indices would be relatively slight.

To the ordinary consumer the application of these principles is somewhat difficult. The vital connection between rating and economy is now better realized. Mr. Sully has recently emphasized the importance of lamps being operated at their rated voltages, and of supply voltages being as definite and constant as possible, in order that lamp manufacturers may rate their lamps at the most economical efficiency. But strictly the efficiency should depend on the price per unit. As an extreme case, the author mentions that until recently he was paying 7d. per unit for all his lighting energy, whilst blocks of flats near by were buying their energy at a uniform price of 1d. Lamps which were economical for the one circuit would be quite unsuitable for the other. Yet the same shop served them both, and there was nothing on the lamps or their wrappers to show that they were not suitable for the same voltage under all possible circumstances.

Very large consumers are in the best position to adapt their lamps to the cost of energy. Large railways, for example, especially electrical tube railways, who can usually obtain their energy at a very low cost, might well find it economical to underrun lamps considerably. The small consumer is in want of guidance, and there can be no doubt of the importance of the problem in view of the fact that the energy cost may frequently amount to 90 per cent. or more of the total cost, and that the price for energy, in different areas and under different conditions, may vary as much as from 1d. to 8d. per unit. It would appear that the least that could be done would be to stamp on the lamp or wrapper the particular energy price as well as the voltage for which the rating was determined.

Unnecessary Types of Lamp Bulbs

Attention is drawn in *The Electrical World* to the prevalent use of electric lamps with bulbs of special design, which are expensive and often unnecessary. In domestic lighting, for example, there are few occasions when the standard form of bulb will not do all that is required. It costs less than the exceptional types, is usually more efficient, and is more durable. Although "spherical bulb" fixtures often form one of the chief elements in exhibitions and displays, probably only 9 per cent. of the lamps used for domestic lighting have such bulbs. If all lamps in the home were properly equipped with shades or enclosing media standard lamps could be used in practically all sockets.

In large interiors—ballrooms, hotel lobbies, etc.—unshaded lamps in the smaller sizes may be permissible if the bulbs are obscured. In such cases spherical or tubular lamps may be justified for the sake of appearance. Nevertheless, their use is often overdone, and in many cases standard types of lamps might equally well be used. In the same way tubular lamps are often used on chandeliers, when much better results would accrue from the use of standard types. From the standpoint of the lamp company the multiplication of types is a drawback, as it is well known that concentration on a few types is favourable to cheapness, efficiency, and durability. As a general principle it may be urged that the time for exposed lamps of any kind, even if bulbs are obscured, has gone by. Much more satisfactory lighting conditions are obtained when lamps are concealed by suitable shades, or glassware, of which there is now a great variety available. Assuming that lamps are covered in this way, there is naturally no object in departing from the standard type. Monotony in lighting is not desirable. But it is chiefly in the choice of shades, glassware and encircling media, that the opportunity for variety occurs.

The Problem of "Mixed" Lighting

One somewhat curious problem that has been considered by the Home Office Departmental Committee on Lighting in Factories and Workshops, and has also, we believe, been referred to the Illumination Research Committee working under the Department for Scientific and Industrial Research, is the effect of "mixed" lighting, e.g., a combination of natural and ordinary artificial light, which is usually somewhat redder in quality than daylight. Some interesting investigations on this point have recently been recorded before the American Illuminating Engineering Society, and we hope to refer to these data shortly.

Results of investigations hitherto have been somewhat inconclusive, but there seems to be general agreement that such mixtures are apt to be troublesome to the eye. The most probable explanation seems to lie in the fact that, the spectra being different, the eye cannot accommodate itself simultaneously to both forms of light. Experience of mixed lighting seems to lend some support to the belief that the average eye accommodates itself somewhat more easily to daylight than to artificial light, owing to the preponderance of the longer wavelengths in the latter.

The most usual example of such mixed lighting is when artificial light has to be used to supplement failing natural lighting in the dusk. In this case the contrast is usually accentuated by the bluish character of the daylight.

It has been suggested that this transition period can best be got over by using a modified form of artificial daylight, and some of the available lighting units which yield light that is visually very close to daylight mix very well, and may indeed be almost indistinguishable.

The Annual Report of the National Institute for the Blind

The annual report of the National Institute for the Blind, which has just reached us, contains an admirable account of the vast amount of work being done for the benefit of those without sight. The activities of the Institute include the preparations of books and periodicals in Braille, a Students' Library and Manuscript Department, the maintenance of schools and colleges, recreations and training centres, etc. It is instructive to note that 14,000 books were published in Braille last year, and nearly twenty times this number of magazines and newspapers; much progress has also been made in the publication of music scores for the blind. The illustrations showing the work of expert blind "proof-readers" are impressive; the efforts being made to find occupation for the sightless, and enable them to enjoy as many as possible of the pleasures of ordinary folk, are worthy of all praise. They can play cards, chess and other games, are often brilliant conversationalists and good walkers, and are completely at home in music. "What they *do* object to is gloom, and there are more laughs in the average blind person than in many a comedy."

Truly the courage with which they support their affliction is admirable. Nevertheless their disadvantage is a very grave one, and there is room for more work in the prevention, as well as the alleviation, of blindness. In the former field the provision of good natural and artificial illumination plays an important part—more especially in schools for children who are partially blind or suffer from severe defects of vision, whose needs are now being made the subject of special study.

Institution of Public Lighting Engineers
Conference at Newcastle-on-Tyne, September 14-16th, 1926

We have now received the programme of the forthcoming Annual Conference of the Institution of Public Lighting Engineers, to be held in Newcastle-on-Tyne during September 14th-16th.

On the opening day, Tuesday, September 14th, there will be a reception by the Lord Mayor (Councillor Anthony Oates) at the Town Hall at 7 p.m. An exhibition of lighting appliances in the Concert Hall will be opened at 8 p.m., and at 8-45 p.m. members and delegates will be conveyed around the city by buses, in order that they may have an opportunity of surveying the lighting arrangements. The final item on this day will be a visit to the Oxford Galleries (New Bridge Street).

On Wednesday, September 15th, the session will be opened, Mr. C. S. Shapley (President) in the chair. After a welcome has been extended to members and delegates by the Lord Mayor, and the transaction of formal business, the new President (Mr. R. Davison, City Lighting Superintendent of Newcastle-on-Tyne) will be introduced, and will deliver the Presidential address. A paper entitled "The Improved Lighting of a City" will be read by Mr. J. F. Colquhoun, Public Lighting Engineer of Sheffield. There will also be a paper on "Motor Traffic in Relation to Lighting (*a*) on the Highway, (*b*) on the Vehicle," by Major Stenson Cooke (Secretary, Automobile Association and Motor Union). At 12-30 p.m. an official photograph will be taken. At 1 p.m. visitors will be entertained to luncheon by the Lord Mayor and City Lighting Committee. At 2-30 p.m. there will be a visit to the Carville Power Station, Wallsend, after which there will be high tea at the Waverley Hotel, Whitley Bay, and an opportunity of inspecting the new Promenade Lighting will be afforded.

On Thursday, September 16th, a wreath will be placed on the War Memorial, Eldon Square. At 2-30 p.m. the session will recommence. Papers entitled "Variation of Hours in Public Street Lighting" (by Mr. R. Beveridge, Superintendent of Public Lighting, Edinburgh), and "Electric Street Lighting of Liverpool" (by Mr. H. Dickinson, Lighting Engineer, Liverpool), will be read. Luncheon, at the invitation of the Newcastle and Gateshead Gas Company, will take place at the Station Hotel, after which there will be a visit to Redheugh Gas Works.

All meetings will be held in the Connaught Hall. The Council Room and Headquarters will be in the Station Hotel, Neville Street. All particulars may be obtained from the Hon. Secretary, W. J. Liberty, Esq., Public Lighting Office, Guildhall, London, E.C.2.

The programme is illustrated by a series of views and description of Newcastle, which has many interesting historical features, and there are several pleasing photographs of Jesmond Dene, a charming public park.

The History of Artificial Lighting

Mr. W. J. Liberty has been invited by the Society of Engineers to give a paper on "The History of Artificial Lighting" before this Society at their first ordinary meeting of the next session, to be held on October 4th in the apartments of the Geological Society, Burlington House, Piccadilly, London, W.

The Illumination of a Large Reading Room*

By H. H. HIGBEE

(Professor of Electrical Engineering at the University of Michigan).

THE paper describes a somewhat special installation in the general library of the University of Michigan. This is a room of magnificent proportions, as the illustrations (Figs. 1 and 2) show. The width of the room is 48 feet for 140 feet of its length, and 36 feet for the last 36 feet at each end. It is 26 feet from the floor to the point where the arched ceiling begins, extending to a maximum height of 50 feet above the floor. There

FIG. 1.—Main Reading Room, General Library of the University of Michigan.

are in all 24 tables, which can accommodate about 250 readers. The lower portions of the four walls are almost entirely covered by shelves.

GENERAL FEATURES OF LIGHTING SYSTEM.

The system of artificial illumination comprises two methods:—

(*a*) A comparatively small component of well-diffused and glareless general illumination produced indirectly. This is furnished by about 100 lamps (each 100 watt, 110 volts) in asymmetrical silvered glass reflectors and concealed in the tops of the bookcases. These distribute a minimum of light on the side walls, and give as nearly as possible uniform brightness to the ceiling.

(*b*) A comparatively large component of well-diffused and glareless local illumination produced by a new form of table unit (see Fig. 3). The table lamp fitting runs the full length of the table midway between readers. It will be observed from the diagram that the light is intercepted by a strip of opal glass, which becomes a secondary source. Above the opal glass tubular lamps are spaced so as to give the glass a uniform brightness. The glass is inclined in such a way that the maximum candle-power is obtained at the edge of the table. A plane mirror set opposite perpendicular to the opal glass serves to prevent the latter being visible to any reader—though it is estimated that the brightness of the opal glass does not exceed that of the average north sky.

The lamps in this fitting are individually controlled, one switch being allotted to each three-foot run, which suffices for two persons. Although the fitting is 22 inches wide and its outer edge about 18 inches from the edge of the table, there is no interference with work.

The general effect of the lighting system will be understood from Figs. 1 and 2, though naturally the photographs do not fully convey the actual effect as seen by the eye. The main object of library lighting is to enable the books it contains to be used, and not to glorify the artist who designed it. Nevertheless, the illumination should be such as to display the interior to the best advantage. The system of lighting here adopted serves to accentuate admirably the fine proportions of this building. There are no hanging fixtures to break the upper spaciousness of the room, and there is nothing to interfere with the view of the mural paintings which decorate the end of the room. The titles of books in cases are amply illuminated to enable titles to be seen, without any unsightly projecting fittings at the top of the cases being necessary. The illumination is well diffused and practically shadowless. There is no glare, either direct or reflected. In Fig. 1 the existence of a perceptible shadow cast by the deep cornice which separates the side walls from the arched ceilings can be seen. This could not readily be avoided except by lowering the cut-off of light from the units over the shelves against the opposite wall to such an extent as would waste light by transmission through the windows, and also diminish the illumination at the uppermost point of the ceiling. Conventional indirect methods might have favoured the installation of units above the cornice instead of over the bookcases; but if someone had to mount 26 feet on a ladder in order to attend to lamps and fittings the maintenance would probably have been poor.

LOCAL LIGHTING.

The chief features of the system of table lamps are as follows:—

(1) The table illumination is glareless. There are no high-lights even in the polished table.

(2) The table illumination is almost shadowless. (Most of what appears to be shadow in Fig. 1 is actually a mirror-like reflection in the highly polished surface of the table.)

(3) The distribution of illumination is very high and even over the working area; there is substantially a cut-off just beyond the edge of the table, so that no light is wasted.

(4) There is an absolute cut-off to the light above a horizontal plane about a foot above the table, thus preventing a view of the luminous surface by any person seated or standing in the room. The arrangement of this fitting contributes largely to the beauty of the room; the appearance of libraries is too often marred by a forest of lamp standards rising from the tables or goose-necks dropping over the bookcases and bearing spots of light.

(5) The local illumination furnished is psychologically sound. The working area is brighter than the surroundings, thus assisting mental concentration. The top-housing of the local units is also considered an advantage

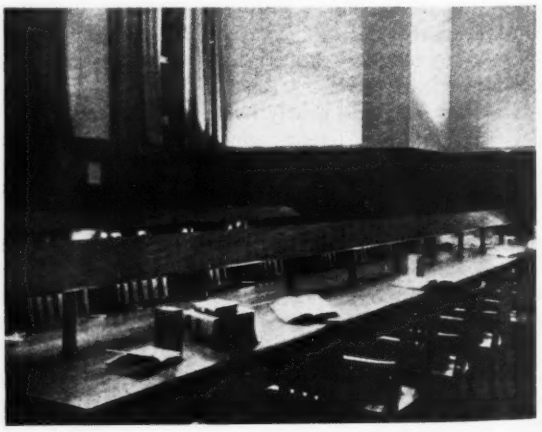


FIG. 2.—Special Table Lamp used in the Main Reading Room.

in this respect, as it obstructs the view of persons seated on the opposite side of the table, so that the attention of younger readers is not distracted from their books!

Another advantage of this local lighting has been demonstrated by the gradual deterioration in the indirect lighting furnishing the general illumination, in

* Abstracts of a paper read before the Illuminating Engineering Society (U.S.A.).

spite of every care being given to maintenance. Originally the illumination furnished by this system was such that reading was possible without the aid of the local lamps. But in course of time, owing to the decline in the general illumination, the local illumination became clearly necessary. On the other hand, deterioration in the local lighting is only very gradual.

Deterioration and Maintenance.

Tests of the general illumination were made shortly after the installation was completed. After the library had been in use for some months another series of tests was made, and it was then found that the illumination had been greatly diminished—the average of 13 measurements being only 28 per cent. of that recorded originally at the same stations. This big decrease was found to be due mainly to deposits of dust on lamps and reflectors. Representations having been made to the librarian, a regular system of cleaning and maintenance was instituted. This had a very beneficial result, as in the subsequent two years the diminution was only about 5 per cent. In the following year scaffolding was erected and the ceilings and sidewalls were refinished at considerable expense. Tests made three months afterwards

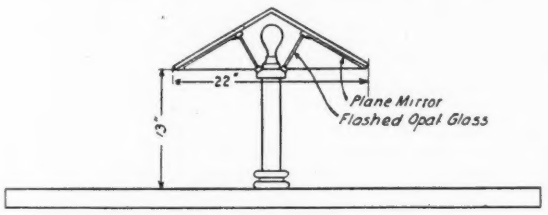


Fig. 3.—Special Table Lamp designed for the General Library, University of Michigan, showing cross-section transverse to table.

showed that the illumination was now twice as great as before the redecoration, though still only about half what it was originally when the installation was quite new. In 1926 another series of surveys of the illumination was made. From this it appeared that the illumination had decreased 17 per cent. since the redecoration was put in hand. It is conjectured that the greater part of this decrease was due to the deterioration of walls and ceilings.

The conclusion drawn from these experiments is that in a period of 6½ years the illumination will settle down to a value of about 20 per cent. of the original illumination. This decrease is not of great moment to the readers, owing to the high local illumination provided. No complaints of difficulty in reading the titles of books have been received (though, in the most recent series of tests, values as low as 0·13 foot-candles were measured in the most disadvantageous positions). Should an improvement in general illumination be found necessary it would probably be more economical to install lamps of higher candle-power than to embark on the costly process of redecorating this lofty ceiling.

Two important factors which probably did not vary after the first year were the lamp failures and the effect of reduced voltage. The voltage was commonly observed to be from 105 to 107 volts at the lamp socket, though the lamps were rated at 110 volts. Thus the lamps were probably only emitting about 87 per cent. of their rated lumens. In order to study effects of voltage variation control measurements were taken of the illumination at certain points in the room. Readings often varied by as much as 14-21 per cent. during a survey, though the change took place so gradually as not to be evident to readers.

The original design of the general illumination was made largely on the basis of fundamental theory, as little published information was available as to the treatment of such lofty rooms. According to calculations it was assumed that the illumination should be 1·5 foot-candles at the centre of the room. The value actually measured averaged 1·29, and the difference can partly be accounted for by various factors, such as the effect of lower voltage than the rated value, as indicated above.

Tests of the illumination furnished by the special table lamps under different conditions showed values ranging from about 13 foot-candles immediately under the fitting to about 6-7 foot-candles at the edge of the table. The minimum illumination was about four times as good as that obtained from the ordinary conventional table lamp, and the uniformity of illumination more than eight times as good. Here again attention is drawn to the effect of drop of voltage. Thus, in one case it was found that the voltage hovered about 101 volts when a whole table was alight, as compared with 105·5 when only a three-foot section was lighted. This may be taken to indicate that the wire used to feed the table lamps was too small.

Artificial Skylight Illumination

In *The Electrical World*, Mr. D. H. Tuck, of the Holophane Co., New York, described the system of lighting now introduced in the Milwaukee Auditorium. The original installation consisted of three rows of bare frosted lamps arranged round a small skylight and a row of bare frosted lamps around the side walls. This illumination was naturally quite inadequate. Later 40 mirrored glass floodlight reflectors were placed above the skylight, light being directed towards the sides of the exhibition space where there was an illumination of less than 0·2 foot-candle. The design was not satisfactory, however, and ultimately it was decided to plan out the lighting afresh. Little was known of the results of this "artificial skylight" system of lighting, but it was known that in the Cleveland auditorium a successful scheme had been introduced. Unless care is taken in the design and choice of reflectors much light is apt to be reflected back from the glass of the skylight and wasted. Considerable attention was given to this aspect of the problem, and various forms of reflectors were tried. Eventually the prismatic type of reflector was adjudged superior, particularly in regard to efficiency, ease of maintenance and ease of adaptation to colour filters.

The following data regarding the Cleveland and Milwaukee installations may be of interest:

Table I.—Comparison of Cleveland and Milwaukee Auditoriums.

	Cleveland Auditorium	Milwaukee Auditorium
Floor area, sq. ft.	30,840	20,927
Skylight area, sq. ft.	15,420	12,232
Ratio, floor area to skylight area	2	1·7
Illumination intensity, foot-candles	8	10
Generated lumens, watt	160,750 2,320,000	203-500 1,908,200
Generated lumens per square foot floor area	75·4	91·0
Type of reflector	Mirrored glass	Prismatic glass
Utilization coefficient, per cent.	10·6	10·9
White light, total kilowatts	120	101·5
Watts per sq. ft. floor area, white light	3·9	4·9
Coloured lighting, total kilowatts	140	203
Watts per square foot floor area, coloured lighting	4·5	9·9
Total kilowatts, white and coloured	260	304·5
Total number of reflectors	320	606
Height of skylight above floor, ft.	80	65
Height of reflector above glass, ft.	7	3·5

It will be observed that the consumption of energy in watts per square foot in both these installations is high compared with values customary in this country. Probably this form of "artificial skylight" illumination is inevitably somewhat less economical than ordinary methods of lighting from overhead units. On the other hand, the resemblance to daylight conditions is exceptionally close, and where economy is not a very vital consideration the method has much to recommend it for art galleries, museums, etc.

Recommendations on Illumination

Issued by the Illuminating Engineering Society in Germany

SOME ILLUSTRATIONS AND EXPLANATORY MATTER

READERS will recall that in our last volume we gave a synopsis of the Recommendations on Illumination issued by the Illuminating Engineering Society in Germany, which in the main were in close accordance with principles advocated in this country. By referring to these past numbers,* in which these recommendations were dealt with, it will be found that values of illumination given for interiors were substantially as follows: For general illumination, approximately 1/10th to 1 foot-candle; for working illumination 1½ to 9 foot-candles.† In regard to external illumination the requirements for traffic varied from 0·02 to 1 foot-candle (average) and 0·01 to 0·1 foot-candle (minimum), being thus generally similar to those adopted for the classification of streets in this country. For factory lighting the values recommended were somewhat higher, but the *minimum* for very fine work (approximately 5 foot-candles) is practically the same as that recommended by the Home Office Departmental Committee on Lighting in Factories and Workshops in this country.

We recall these data as an indication of the agreement between British and German practice in values of illumination. But in the report containing these recommendations the Committee was careful to make it clear that *sufficient illumination alone is not enough to ensure good lighting*. Special importance was attached to such matters as freedom from glare and troublesome shadows, diffusion and distribution of light, avoidance of excessive contrasts in brightness, efficient maintenance and safety precautions, etc. In regard to glare, it was recommended that lamps coming within the direct range of vision and used for local lighting should not have a brightness greater than 0·75 candle (Hefner) per sq. cm. (this is roughly equivalent to 5 candles per square inch). Lamps for general lighting, and thus much further removed from the eye, were permitted to have a brightness of 5 candles (Hefner) per sq. cm. But this value must not be exceeded unless the lighting units are so situated that the angle between the line from the eye to the source and the horizontal is not less than 30°. Here again we see a close resemblance to the measures advocated in this country.

It was recently announced that the German Illuminating Engineering Society was about to issue an illustrated booklet restating and explaining these recommendations. We have now received a copy of this booklet, by the courtesy of our esteemed correspondent, Dr. Lux, of Berlin, from whom we have also received the various blocks illustrating this note. In this revised edition of the recommendations the importance of the angle mentioned above is emphasized by illustrations. There are also many pictures showing contrasts between good and bad lighting and emphasizing fundamental principles in illumination.

The first two illustrations we have selected (Figs. 1 and 2) are intended to show the drawbacks of excessive contrast attending unrelieved

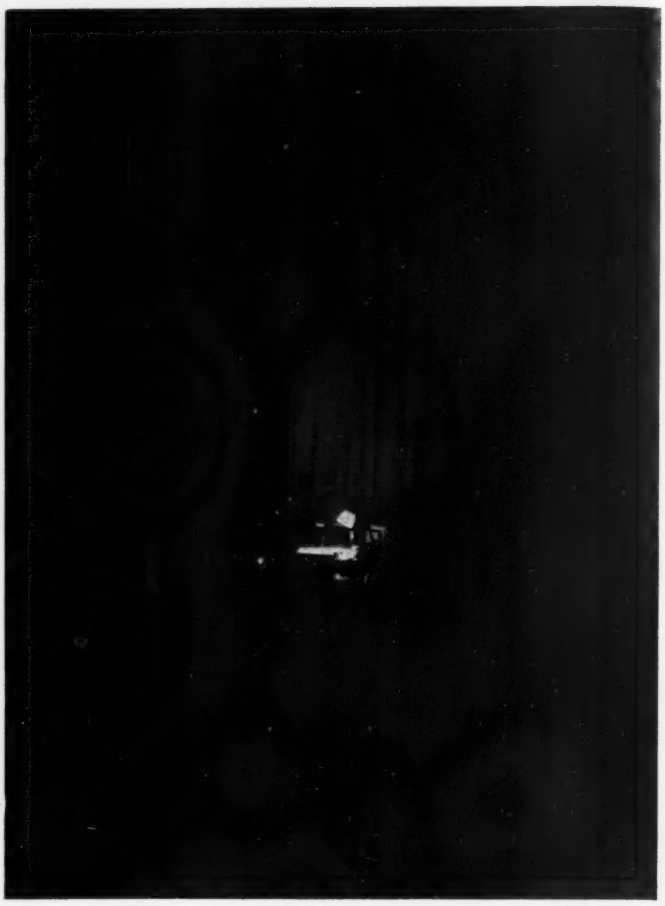


FIG. 1.—Unsatisfactory lighting of workroom by a single local lamp. Severe contrasts between brightness of workplace and surroundings, with consequent fatigue of the eye.

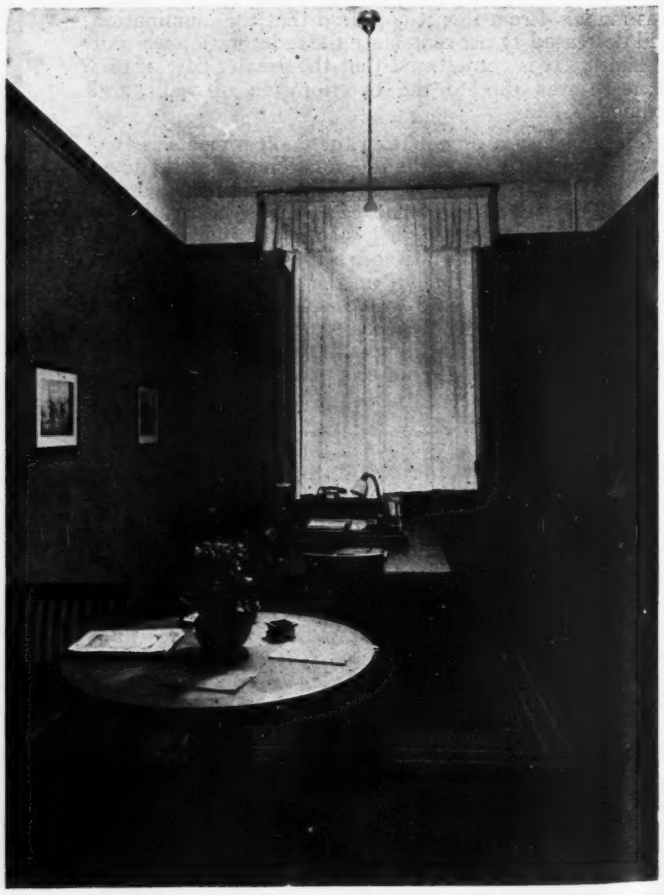


FIG. 2.—A much better system. General illumination, with supplementary local lighting, is provided, thus eliminating excessive contrast.

* See *The Illuminating Engineer*, April, 1925, pp. 96-97; May, 1925, pp. 130-132.

† These values are derived approximately by dividing the values given in lux by 10.

FIG. 3.—Local lighting by imperfectly shaded lamp. Only a small proportion of the light falls on the working area; a much larger amount falls on the face of the operator, causing glare and interfering with clear vision.

FIG. 5.—Pure local lighting resulting in bad distribution of light and excessive contrasts and great inequalities in illumination.

FIG. 4.—Local illumination with well-shaded lamp. Practically all the available light is directed on the work, and the eyes are completely protected, giving clearer vision.

FIG. 6.—Pure general lighting by overhead concentrating reflectors. Glare is eliminated by the great height of the lamps and effective shading, contrasts are diminished, and the illumination is much more uniform.

local illumination. It was pointed out in the very early stages of illuminating engineering by Dr. Louis Bell that the habit of using a local lamp without sufficient general illumination in the room is liable to cause eye-strain. In Fig. 1 we have bad conditions in this respect. A reader, truly, would have ample illumination at his workplace; but every time he looked away from his book the eye would receive a shock as it endeavoured to accommodate itself to the surrounding darkness. In Fig. 2 we see arrangements removing this defect. Besides the reading lamp (here shown unlighted) we have moderate general illumination from the overhead unit. The surroundings are no longer left in darkness, and it is possible to work in comfort.

In Figs. 3 and 4 we have familiar illustrations of the drawbacks of an unshaded local lamp. In Fig. 3 the worker is dazzled by the bare lamp right in front of his eyes, and the fact of its not being provided with an efficient reflector (but only a shallow conical shade) means that much light is directed outwards and wasted. In the arrangement shown in Fig. 4 matters are much better. The filament is now completely screened by the reflector, so that the worker is freed from glare. The reflector also enables the light to be concentrated downwards on the lathe, where it is chiefly needed. This illustration closely resembles that included in *Light and Illumination; their Use and Misuse*, an illustrated booklet issued by the Illuminating Engineering Society in this country shortly before the war. On that occasion we were careful to point out that, in adopting this arrangement, we must avoid the defect of excessive contrast illustrated in Figs. 1 and 2. Hence in a workshop local lighting of this description should be supplemented by moderate general lighting, so that the surroundings are not too dark.

This point is again illustrated in Figs. 5 and 6, in which the effect of pure local lighting and overhead lighting is contrasted. Overhead lighting of the kind shown in Fig. 6 is now very generally used in workshops devoted to fairly rough work, and has many advantages —notably the fact that light sources are out of the way, and a clear view of the entire room is presented. But there are always apt to be cases of fine work for which local lighting by well-shielded lamps is useful; hence the desirability of allowing plug outlets from which portable local units can be taken when desired.

The final illustrations (Figs. 7 and 8) again deal with this question of contrast. In Fig. 7 we have lighting by local lamps with opaque shades—pure local lighting. The result is good in so far as filaments are completely screened from the eyes of workers. But the contrast between the brightly lighted table and the dark surroundings is again manifest, and it is clear that the eyes will be fatigued by this constant alternation of brightness and darkness.

In Fig. 8 translucent diffusing shades have been substituted. These allow a certain amount of light to penetrate to the surroundings so that the contrast is less severe. We have, in fact, partial general lighting. But it would probably be considered that even in this case the conditions would be bettered by the adoption of supplementary general lighting. In a final figure in the original booklet a third method, general lighting from diffusing overhead units was illustrated. This has advantages in regard to avoidance of excessive contrast; but the positions of lights have to be selected with care in order to avoid troublesome shadows from the hand or body of the worker, and in particular the sources should not be too few or too far apart.

We have selected these illustrations because they all teach useful lessons in regard to avoidance of glare and elimination of excessive contrast—the latter a defect which is apt to be overlooked in installations that are otherwise satisfactory. Such pictures form a useful addition to recommendations on lighting, and the Illuminating Engineering Society in Germany are to be congratulated on their enterprise in producing this little booklet.

FIG. 7.—Pure local lighting by lamps with opaque reflectors. The illumination is ample but unsatisfactory. There are sharp contrasts between the brightly illuminated table and the dark walls, leading to fatigue of the eyes and diminished working efficiency.

FIG. 8.—Pure local lighting by portable lamps with translucent shades. The contrast between the brightness of table and walls is diminished, and the illumination is somewhat more uniform.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Some Notes on Electric Lamps

No. 13

THE INTERNAL FROST LAMP

By W. J. JONES, B.Sc., A.M.I.E.E.

ALMOST since the inception of the electric lamp industry attempts have been made to reduce the intrinsic brilliancy of the light source by some form of obscuring and quite early in the development of the electric lamp manufacturers frosted the exterior of the lamp bulb.

The two chief methods of frosting that have been used are generally known as sand-blasting and acid-etching. In the former the glass bulb is subjected to a blast of very fine sand, which pits and scratches the surface of the lamp bulb, while in the acid process a solution with hydro-fluoric acid as a base, acts chemically on the bulb surface, producing minute corrosions of the surface.

This problem of intrinsic brilliancy became still more acute when the gas-filled lamp was introduced with its filament of enormously high intrinsic brilliancy, and engineers have employed a number of methods in order to reduce the intrinsic brilliancy of the light source to a reasonable value. The outside frosting method was tried, but it was found that in every case the roughened surface of the bulb collected dirt and dust, which caused rapid falling off in the efficiency of the lamp.

The latest development is the internal frost lamp. The idea of an internally frosted bulb is not new, for lamp makers have been trying to produce a satisfactory product for more than 20 years. The difficulty, however, has been that a bulb when frosted on the inside in the ordinary manner becomes extremely brittle. The present method of manufacturing internally frosted lamps entirely overcomes these objections, and the new internally frosted lamp bulbs are equally as robust as the ordinary bulb.

In one method the interior of the bulb is sprayed with a strong solution of acid, which produces the etching. When this process is completed the glass under the microscope appears to be made up of myriads of irregular little projections with many sharp angles. In this condition the glass is weak, and a slight pressure is sufficient to shatter it. The bulb is now treated with another acid solution, which serves the purpose of removing the sharp edges, so that under the microscope the glass appears smoother and the etchings more regular. The bulb is now again robust in every way.

Measurements which have been taken indicate that from the point of view of efficiency the new lamps are a great advance on any obscured lamp which has hitherto been made. The absorption of the internal frost is only 2 per cent., so that 98 per cent. of the light emitted by the filament is available for use. One of the reasons why the internal frost lamp is more efficient than the external frost lamp is due to the fact that internal reflections only take place from the reflecting surfaces, whereas with the externally frosted lamps each reflection takes place through two thicknesses of glass bulb, with corresponding absorption. These new lamps present a light neutral or grey appearance, and are manufactured exclusively with spiralized filaments, while a light frosting conceals the bright filament, so that a diffused light is obtained, free from harsh striations and shadows.

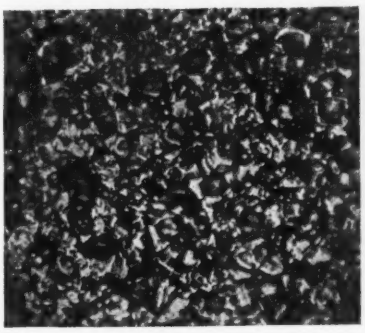


FIG. 1.—The untreated inside-frosted surface magnified 1,035 times.

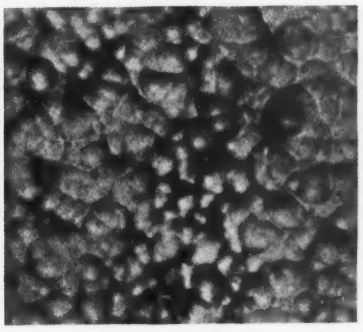


FIG. 2.—The treated inside-frosted surface under the microscope.

Obscured Bulbs and Absence of Glare

The Internal Frost Lamp, described above, is a useful addition to the available methods of diffusing light from lamp bulbs. The white sprayed bulb was a distinct advance in this direction, and there are also available special bulbs of white glass that have a smooth exterior and excellent diffusing qualities. The consumer has thus no excuse now for using clear bulb lamps in the direct line of vision. The introduction of the internal frost lamp should have an important effect in eliminating glare from such misuse of lamps. At the same time it should be understood that these advances in the manufacture of lamp bulbs by no means eliminate the necessity for using proper reflectors or glassware. These are as necessary as ever from the standpoint of proper *direction* of light.

Installing Electricity on Poultry Farms

THE MECHANICAL PROBLEMS INVOLVED IN THE USE OF ARTIFICIAL LIGHTING IN POULTRY HOUSES.

AT the tenth Annual Poultry Conference held at the Harper Adams College, Newport, Salop, on August 12th, Mr. R. Borlase Matthews read a paper upon the above subject. He drew the attention of his audience to the fact that few farmers realize the extent to which electricity is their servant. For the poultry farmer its main uses are in connection with the lighting of the laying houses (to further the increased winter egg production), of the brooder houses and the incubator room. Further, there is the utilization of electricity for the automatic heating of incubators and hovers, the operation of electric fans in incubators for the better circulation of the warmed air, the application of ultra-violet rays, the operation of an ozone-generating apparatus, the maintenance of an H.T. discharge, and the purely mechanical tasks of the poultry farmer in connection with the pumping of water and kibbling, and crushing of grain, etc.

Obviously the installation of electricity is a costly matter from the capital point of view, but the results yielded justify the expense incurred, now that sufficient experimental work has been accomplished for the poultry farmer to have at his disposal expert knowledge as to the exact layout required. It is not generally as well known as it should be that capital for an electrical installation, whether the farmer be a tenant or a landlord, can now be raised through an organization which operates in conjunction with the Ministry of Agriculture.

Turning to the engineering problems involved, the author first dealt with wiring, recommending a simple system which can be tackled by a handyman without specialized knowledge. Naturally an important aspect of the question is the intensity of the light required, and experience has indicated that this should be about a foot-candle on the floor level. The lamps should be hung at least six feet from the floor, all rays should be reflected on to the feeding space, and the lights should be fitted with extensive type reflectors.

The author gave tables which enable the number of lamps required to be deduced from the dimensions of the poultry house, bearing in mind the type of lamp, the type of reflector, and the voltage of supply, a 40-watt vacuum type lamp with pip end frosted, mounted in an extensive enamelled reflector, will suit most poultry-house conditions. This unit should be placed six feet above the ground and ten feet from the adjoining lamp. One of the questions next in importance is the question of control, which can be of an automatic nature. Clocks can be obtained which do all but talk, and by means of which the lights are dimmed at appropriate times to simulate dawn and twilight, and automatically follow the earlier or later rising and setting of the sun, so that the birds find artificial conditions closely akin to those of Nature in the sub-tropical regions whence they originated. The references in the paper to ultra-violet light treatment for poultry aroused considerable interest, as information on this subject is being eagerly sought.

There is reason to expect that poultry, like other animals, would benefit by the use of "artificial sunlight," which has been found to have good effects at the Zoo.

For distribution purposes, on the poultry farms, overhead wires are recommended, the poles being such that the wire is kept 12 feet above the ground or six feet above the buildings. Voltage of at least 100 is best for farm work of any kind, as it will allow for expansion when the poultry farmer wishes to do more than merely light his own residence. The man who can take advantage of a public supply is very fortunate, as the supply is unlimited at all hours, and always cheaper than that obtained from a private plant. If this is not possible, there are now a number of small plants on the market which can be purchased without fear of their proving to be unsuccessful.

A New Lighting Installation at the Royal Horticultural Hall, Westminster

The Royal Horticultural Hall, Vincent Square, Westminster, will be known to many of our readers as the Mecca of those interested in flower-growing. There the annual show of the National Rose Society is held, and at frequent intervals every year flower shows of all descriptions take place and new varieties constantly exhibited. It must be admitted that hitherto the artificial lighting of this fine hall has hardly been worthy of its traditions, and it is satisfactory to learn that improvements are now being taken in hand.

One of the chief requirements is naturally a quality of light which approaches daylight in colour-revealing qualities. We understand that the new scheme provides for overhead lighting by the standard "Restlight" fittings, which should be an improvement in this respect. But additional floodlighting with pink and amber light is also being installed, the light being directed upwards so as to produce a pleasing colour contrast. This coloured light serves only for decorative purposes, and the brightness of the illuminated ceiling is not sufficient to have any material effect on the colour of the light illuminating the flowers. The pink glass used is of a special make, so as to give the requisite clear effect. It is common knowledge that this is one of the most difficult colours to render satisfactorily, most pink glass being apt to be of a cloudy nature.

The lowest row of amber floodlights can also be directed downwards if desirable, but this arrangement will only be adopted on special occasions; for instance, when the floor has been cleared for a dance.

The Need for Up-to-date Conditions in Music Halls

A theatre manager, in a contribution to *The Daily Express*, remarks that theatres throughout the country seem to be flourishing. But the decay of the music hall is, he says, apparent everywhere. He attributes this partly to the fact that the provincial taste is higher than formerly, and a more elaborate entertainment is expected.

"Another point is that most of these theatres are out of date compared with their younger rivals. Until theatre proprietors recognize that hard pit and gallery seats, bad acoustics, and meagre lighting are things of a past generation the public will continue to ignore them in favour of the more modern halls."

One is glad to note the importance attached to good lighting. In the recent discussion before the Illuminating Engineering Society instances of many excellently lighted provincial halls were given. But nevertheless there is a great deal of leeway to be made up in the lighting of many provincial entertainments. The ease of modern transport is a factor to be reckoned with. People in the provinces come to London much more frequently than in the past, and, naturally, are quite alive to any deficiencies in local places of entertainment as compared with those in the Metropolis.

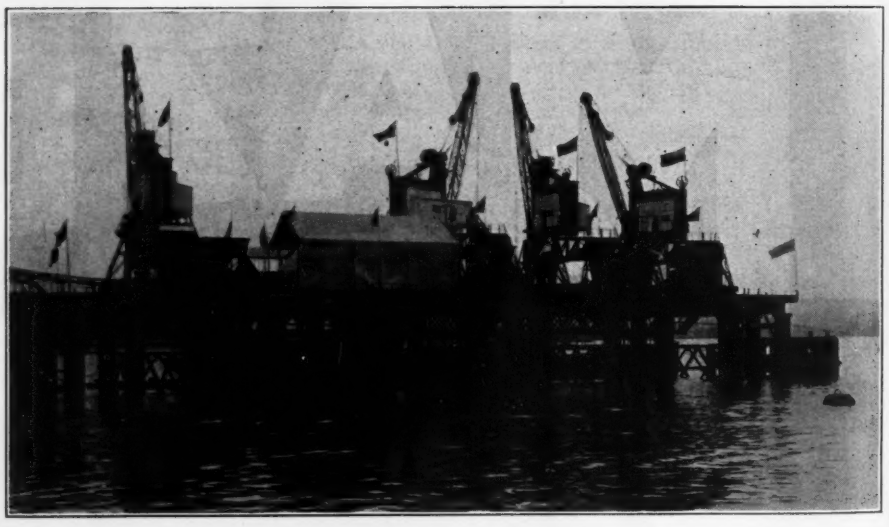
The Artificial Lighting of Tennis and Badminton Courts

The artificial lighting of indoor areas for badminton and lawn tennis still forms one of the most baffling of problems. We notice that a paper on this subject is being read at the Convention of the American Illuminating Engineering Society, and it was discussed before the Society in London a few years ago. Experiments on the lighting of badminton courts are now being made at the Alexandra Palace and elsewhere, and at the Queen's Club the illumination of covered lawn tennis courts has been closely studied, though we believe that the problem is regarded as by no means completely solved. One of the chief difficulties in lighting the large area required for covered lawn tennis courts is the expense; but in the case of the smaller area needed for badminton courts the difficulties in this respect are less severe. As badminton is primarily an indoor game the need for good artificial lighting is evident.

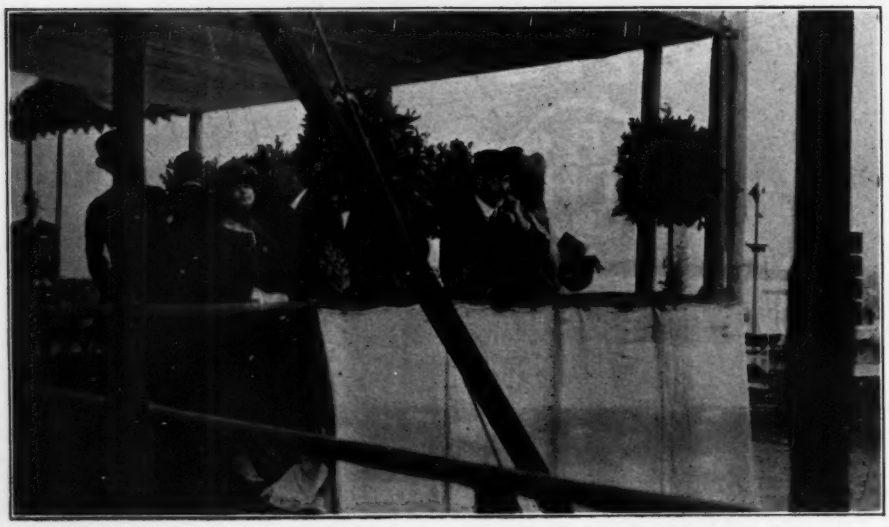
Visit of Their Majesties The King and Queen to the Beckton Gas Works

SINCE its Incorporation by Royal Charter in 1812, The Gas Light and Coke Company has grown to be the largest gas company in the world. Over an area of 265 square miles extending from Windsor Great Park to Epping Forest, it brings cheap and smokeless heat, light and power to the homes of millions of Londoners and to factories for thousands of industrial processes. The recent starting of new coal-handling plant at Beckton was a most opportune occasion for the visit of Their Majesties the King and Queer, who spent fully three hours on the Company's estates inspecting the many fascinating operations taking place in various parts of the works, and the facilities provided for sports and recreation on the part of the staff.

Immediately prior to pulling the lever which put the grab chains in action, His Majesty said: "I am very glad to visit this old-established Gas Works at Beckton, and to inaugurate an important addition to the plant, for I realize how essential the Gas Industry is to the daily life of the community."



The new coal-handling plant is capable of unloading 2,000 tons an hour. The coal is delivered by the cranes into hoppers and so fed to large belts, by which it is carried either to barges for transfer to other works of the Company, or to the 6,000 ton hoppers over a viaduct for use at Beckton.

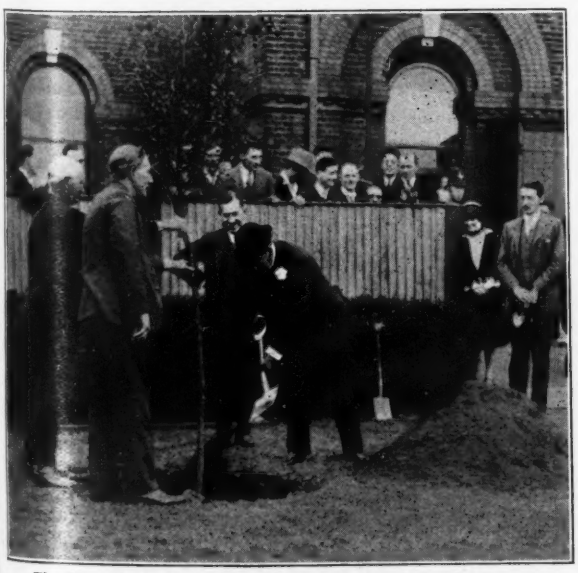


Their Majesties the King and Queen watching the giant grabs descending. The coal required by the Gas Light and Coke Company every year amounts to 2¼ million tons. The yearly output of gas is 235,000,000 therms. Pennies are inserted in the Company's slot meters at an average rate throughout the year of about 100,000 an hour.

The Gas Light and Coke Company is on His Majesty's Roll in connection with the employment of Ex-Service Men. Two companies of the Rangers Battalion of the London Regiment are officered and manned by Gas Light and Coke Company men, and a third company is in process of formation.

Her Majesty is presented with a bouquet of orchids by Florrie Dodds, the little daughter of one of the Company's Deputy Foremen.

Their Majesties returning from a visit to the tennis courts. The Company's Sports Association has nearly 100 acres of ground in London.



The King plants a poplar tree in the Company's Sports Ground.

The Queen also plants a tree, amid scenes of great enthusiasiam

TRADE NOTES & ANNOUNCEMENTS

DEVELOPMENTS IN INCANDESCENT LAMPS.

During a recent visit to Messrs. Philips Lamps Ltd. we had an opportunity of seeing some of the large sizes of projection lamps taking currents of 30-40 amperes, or even higher. The filament is mounted in a very stout and compact spiral, and the whole method of arranging the leading-in wires and supports of filaments carrying such big currents gives evidence of very careful design. Such lamps may be expected to prove quite useful in the kinema industry, and we understand that experiments with them for kinema projectors on a practical scale are being made. The life is naturally comparatively small, owing to the fact of such lamps being overrun in order to obtain the maximum brightness, but we believe it would be found in many cases that the specific consumption is not far removed from 0·25 watts per candle—a remarkable value to attain with an ordinary incandescent lamp. "Projection" lamps now cover quite a variety of forms. The type of lamp intended for use in a kinema projector is quite distinct from that intended for floodlighting. Low-voltage projection lamps with small bulbs for motor-car headlights are also a special feature. We believe that the limits in the design of very large lamps for lighthouse work has by no means been reached, though it is understood that types consuming up to 10,000 watts have been developed. Other special lamps have also been evolved for aerodrome lighting, particularly the illumination of landing areas.

A speciality of Messrs. Philips Lamps Ltd. is the tungsten arc lamp for micro-projection, which was recently described in this journal by Dr. Halbertsma. The tungsten sphere in these lamps proved to be unexpectedly small, and this is doubtless an advantage for optical projection. The chief feature of this lamp, however, is its self-starting character and the simplicity of the whole arrangements, no regulating mechanism being required.

One more lamp which we examined is that provided with bulbs of tinted glass, whereby a good imitation of the colour of daylight is secured. The blue colouration adopted in this case struck one as much more likely to give a good resemblance to daylight than that adopted in some other types of lamps. A somewhat unexpected application of this "daylight" lamp, in the small bulb type, is for motor-car headlights. Motorists apparently have found the "daylight" effect an advantage in driving, as the glare is stated to be appreciably less.

CIVIC VISIT TO OSRAM WORKS.

The Mayor and Corporation of Hammersmith and many influential ladies and gentlemen from the borough visited the Osram Lamp Works on the 15th July. The visitors were received by Mr. C. Wilson, and subsequently conducted through the works; the guides who escorted the party thoroughly explaining the various processes and operations incidental to the manufacture of Osram lamps and Osram wireless valves. The visitors also inspected the various staff welfare arrangements, which are of a most comprehensive nature.

The Mayor expressed pride that so prominent an industrial organization should be situated within the borough, and Mr. C. Wilson, in replying, referred to the cordial relations which had always existed between the Osram Lamp Works and the Council.

FORTHCOMING GAS CONFERENCES.

We understand that the fifteenth annual conference and general meeting of the British Commercial Gas Association will be held in Newcastle-on-Tyne during October 25th-27th. Members of the Gas Salesmen's Circle will be meeting in Birmingham on September 11th at the Universal Smoke Abatement Exhibition. The opening address will be by Mr. F. W. Goodenough, and Miss Gladys Burlton (late director of education to Messrs. Selfridge Ltd.) will give an address entitled "Turning Complaints into Goodwill."

"EMVEE" LAMPHOLDERS.

In a recent issue we illustrated and described the "Emvee" lampholder, and we have now received from Metro-Vick Supplies Ltd. a sample of this device. This is neatly packed in a little box, which also contains examples of the old and the "Emvee" plungers for comparison. Amongst the advantages of the latter are the larger and stronger spring, which carries no current; and the fact that the plunger is solid and cannot burn through at the end, stick or come loose. In addition the porcelain is of a much stronger design. These special lampholders are being placed upon the market by Metro-Vick Supplies Ltd., and are manufactured under the patents of the Mycromet Manufacturing Company.

We have also to acknowledge the receipt from Messrs. Metro-Vick Supplies Ltd. of their Electrical Accessories Supply List (Section B), which is very representative, lampholders (including the "Emvee"), switches and plug adapters, ceiling plates, etc., in various special modern types, being illustrated.

RECENT "RESTLIGHT" INSTALLATIONS.

Some time ago we referred to the difficult problem of lighting badminton courts. We understand that experiments are now being made with the "Restlight" system on the courts of the Alexandra Palace in North London. "Restlight" fittings have also been installed in the County Hall at Maidstone, and in the new offices of the Hammersmith Borough Council.

B.T.-H. RADIO VALVES. REDUCTION IN PRICE.

A notice issued by the British Thomson-Houston Co. Ltd. intimates considerable reductions in prices of radio valves. The changes are in some cases substantial, e.g., in the B7 type from 24/6 to 18/6. At the same time three new types are announced. B2 is a general purposes bright emitter rated at 5 volts, 0·7 amp.; B5H is a companion for the B5 type, but specially designed for H.F. and detector stages; and B4H completes the line of 6-volt dull emitters by also catering for the H.F. and detector stages.

THE MAURICE WOLF (NICKEL-CADMIUM) LAMP.

We have received from the Wolf Safety Lamp Co., of Sheffield, some particulars of the above lamp. The 1926 model has a number of special features, and is stated to give double the present average illumination, with no visible drop during 10 hours. The lamp is designed to distribute light uniformly in all directions. The design is very compact and mechanically strong, and the nickel-cadmium battery used is claimed to have an exceptionally long life, and to withstand overcharging, overdischarging or short-circuiting without injury.

THE LAMPLOUGH DAYLAMP LTD.

CHANGE OF ADDRESS.

Readers are asked to note that from July 18th onwards the new address of the Lamplough Daylamp Ltd. has been 40, Norfolk Street, Strand, London, W.C.2. The new telephone number is Central 4302.

CONTRACTS CLOSED.

The following contracts are announced :—

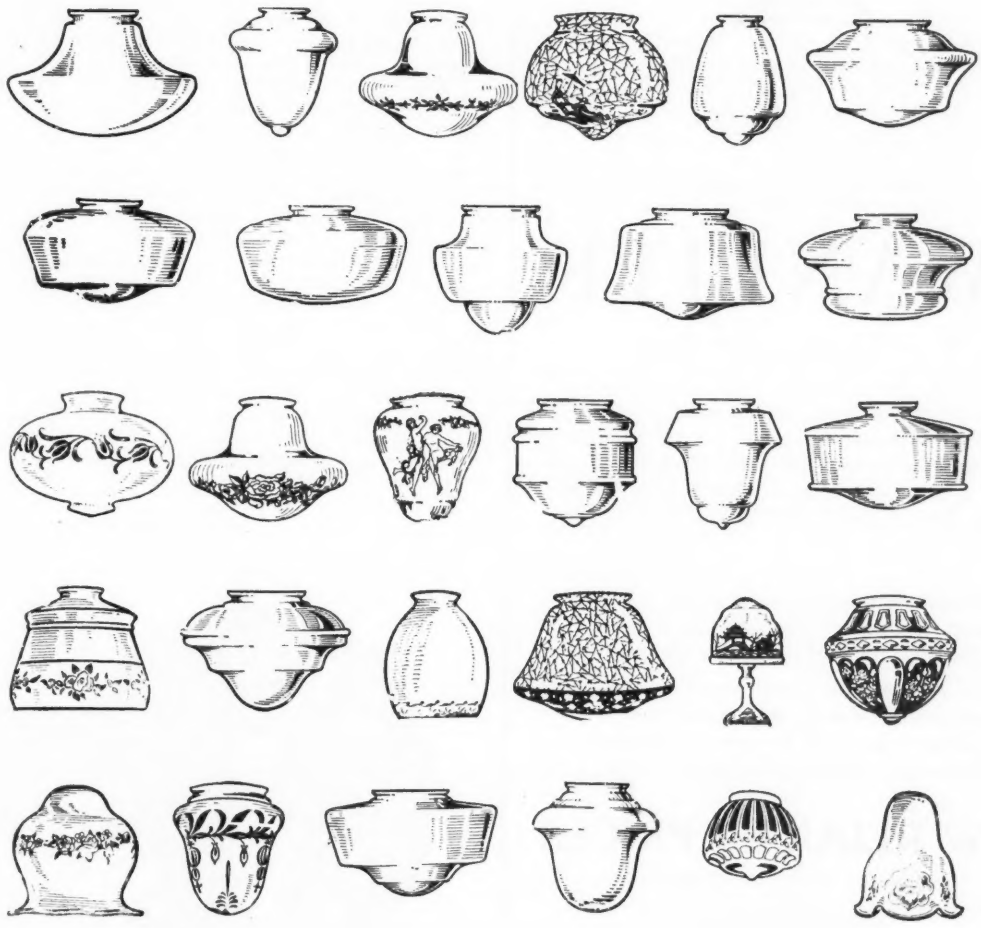
METRO-VICK SUPPLIES LTD. :

London County Council; part contract for electrical accessories for 12 months from August 1st, 1926.

Admiralty; part contract for "Cosmos" Vacuum and Gasfilled Electric Lamps.

GREAT EFFORT TO SAVE BRITISH GLASS INDUSTRY

The British Glass Industry, in spite of having been refused sorely-needed help, is being rescued from its sad plight by Ackroyd & Best, Ltd., the well-known makers of Hailglass Ware. At 98, Mansell Street (opposite the Royal Mint and the Tower of London), this firm has established a Glass Makers' Camp in order to demonstrate the wonderful resources of their great factory at Morley, near Leeds.



They have stocked these large premises with large quantities of plain and decorated Shades, Globes, Bowls and Vases of all sizes and shapes. The Trade are requested to visit and buy from this large stock, which in variety and range and artistic excellence rivals that of the large foreign firms. By so doing they will not only obtain glassware which meets every modern requirement, but they will also help British glassworkers in their fight for existence, and keep British money in this country.

ACKROYD & BEST, LTD.
98, MANSELL STREET, LONDON, E.1

SIEMENS "SILVALUX" AND "PURLITE" LAMPS. REDUCTION IN PRICE.

Messrs. Siemens and English Electric Lamp Co. Ltd. announce important reductions in the price of "Silvalux" opal gasfilled lamps, to operate from September 1st onwards. Particulars are given on page 6 of catalogue No. 200. Prices of the new Siemens "Purlite" internally-frosted gasfilled and vacuum lamps are also being reduced. Both these forms of lamps have useful properties, both as regards elimination of glare and pleasing appearance, and the reduction in price should add to their popularity.

ADVERTISING THAT HELPS THE DEALER. THE "MAZDA" 1926 CAMPAIGN.

In view of the approaching Electrical Ballot, "Wiring the Homes of Britain," to be launched in October by the combined E.D.A. and E.L.M.A. efforts, the activities of individual firms in the lighting industry also deserve notice. The autumn and winter season will be marked by the initiation of the E.D.A.—E.L.M.A. "Better Home-Lighting Campaign," and all this publicity will doubtless have a considerable influence on sales of lamps, of which advantage will be taken by leading makers. One of the most striking items in the 1926-1927 "Mazda" lamp advertising campaign is the specially designed "illuminated cut-out," featuring the familiar "Mazda" girl holding aloft and in front of a clock face a "Mazda" lamp to "lighten the dark hours." The cut-out is 40 in by 30 in., but when erected the display is only 5 in. or so deep. Two lamps illuminate the device, one producing the flashing illumination of the clock face, and the second continuous illumination of the word "Mazda," behind which the figure of the girl appears to stand. The cut-out is provided with a thermal flasher, two lampholders and an adapter, ready fitted to a length of flex for immediate use in the trader's window.

The B.T.H. Company are also issuing a new "Mazda" showcard of considerable merit. This depicts three children solemnly examining a "Mazda" gasfilled lamp, and the appended title "Daddy Says It's Bottled Sunshine." There is also available an extended series of leaflets to complete this comprehensive advertising campaign. Finally, we may mention the 36-page "Mazda" lamp catalogue giving full details and dimensions of all the wide range of lamps now available.

We reproduce below the "Illuminated Cut-out" referred to above. Several of the other devices are equally striking and they form effective propaganda matter.

A view of the new "Mazda" Illuminated Cut-out.

SOME EXHIBITS AT THE FORTHCOMING ANNUAL CONFERENCE OF THE INSTITUTION OF PUBLIC LIGHTING ENGINEERS.

An important feature of the above conference, to be held in Newcastle during September 14th-16th, will be the representative collection of lighting exhibits. We shall be giving an account of these exhibits in our October issue, when we shall be dealing generally with the conference. But meantime it is of interest to mention a few features of the display, of which particulars have already reached us. Numerous firms are displaying street-lighting fittings. Messrs. Siemens and English Electric Lamp Co. Ltd. are exhibiting a variety of lanterns, and also switchgear and a variety of lamps for street lighting. These lamps will include the Siemens "Silvalux" opal gas-filled lamps and the new "Siemens Purlite" lamps, which are internally frosted.

Holophane Ltd. will have on view a wide variety of prismatic reflectors illustrating modern developments in directional street lighting. These include types suitable at street intersections of various kinds, such as "T" and "4-way" conditions. There will also be ornamental upright-type units with symmetrical distribution for parks, open spaces, etc. Tables are furnished showing the recommended illumination for various classes of thoroughfares, and—an important feature—advice on the use of all these types of equipment is fully given by the company's illuminating engineering department.

We also understand that the Photector Co. Ltd. are showing two of the new "Dia" long-burning flame arc lamps, which have recently attracted considerable attention in this country. Another feature of the Photector exhibit will be the new catoptric lanterns (these are really parabolic reflectors with a prismatic glass lining), which are claimed to possess special advantages as regards avoidance of glare, even distribution, and ease of cleaning. Other novel items will be the "Unilux" and "Tombac" lanterns.

We are informed that Messrs. Benjamin Electric Ltd., are exhibiting their "Rodalux" and distributing reflector fittings, amongst other appliances, for street and highway lighting, and will welcome a visit from all interested. One of the chief features of the display of the General Electric Co. Ltd. will be the "Wembley" street lanterns of various types. Messrs. Metro-Vick Supplies Ltd. will display samples of their "Brighton" and "Paisley" lanterns, as supplied to these two Corporations for street lighting. In addition there will be pole-mounting and pillar-mounting brackets with various types of street lighting fittings, reflector units, etc.

A GLASS-MAKERS' "CAMP."

AN ENTERPRISING DEPARTURE IN EAST LONDON.

An interesting step in connection with the development of British glassware is the establishment of what has been described as a "camp" at 98, Mansell Street, near the Tower of London, by Messrs. Ackroyd & Best Ltd. The importance of the British glassware industry hardly needs emphasis. Messrs. Ackroyd & Best have assembled at their works some of the finest workers in this field, and are producing illuminating and ornamental glassware in great variety. At the large warehouse in Mansell Street a portion of the large stock of glassware held at their Morley Works is now on view for the benefit of London factors, contractors, and shopkeepers. All this glassware is made entirely in Great Britain, and is well worth inspection.

This enterprising step has been carried out in order to stimulate the sale of British-made glassware, and there can be no question of the advantage of having a comprehensive display always available in London. It is now accepted as a fundamental principle that in matters of illuminating engineering an appeal to the eye is the most convincing method. In the past Londoners have not always had sufficient opportunities of viewing the products of British glassworks situated in the North of England. The "camp" established by Messrs. Ackroyd & Best should go far towards meeting this need.

Apart from the scale on which this exhibit is being organized, it is worth noting that Messrs. Ackroyd & Best not only manufacture their well-known "Hailglass-ware" on the mass-production principle, but also prepare special designs of the most dainty and delicate glassware. Thus they are prepared to meet all requirements. One manifest advantage of this central store is that buyers will be able to take away the pieces actually required, and they will be free from the expense and inconvenience entailed by breakages, such as are apt to occur in the case of goods dispatched from distant countries.

Experience during the war demonstrated the vital importance of an adequate supply of British-made glassware, and it is of the greatest importance, from the illuminating engineering standpoint, that manufacturers in this country should be able to hold their own with makers abroad. It is to be hoped, therefore, that this enterprising effort will receive the support it deserves.

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